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CRETACEOUS PALYNOMORPHS OF TAIWAN (2) -Taxonomic Treatment [1]

Cheng-Long Shaw [2,4] and Tseng-Chieng Huang [3]

ABSTRACT: Fifty eight form genera, one hundred and thirty four form species of fossil sporomorphs were reported from the early Cretaceous formations based on materials from seventeen exploration wells in Taiwan. Among these reported, there are fourty-five form genera and ninty eight form species of pteridophytic spores, eleven form genera and twenty six form species of gymnospermous grains, and two form genera ten form species of angiospermous grains and one form genus and one form species of algal spores. These early Cretaceous sporomorphic assemblages are predominated by gymnospermous forms in species quantity but by pteridophytic forms in species diversity. Angiospermous species are only represented by primitive monocolpate and tricolpate pollen grains.

KEYWORDS: Cretaceous palynomorphs, Taiwan, Taxonomy.

INTRODUCTION

The palynological investigation of Cretaceous sedimentary rocks in Taiwan began in 1985 by the first author (Shaw, 1985) and Yuan et al (Yuan et al, 1985) in offshore of Kaohsiung and Peikang areas. During 1985 and 1986, the first author again collected sedimentary rocks of the Cretaceous from 17 exploration wells in offshore of Taiwan and Peikang areas. These samples were brought to the Chinese Petroleum Corporation (CPC) micropaleontological laboratory for the preparation of pollen slides. The description of these fossil palynomorphs was started in 1986. The first part of this work on fossil palynomorphs is presented here. The work is still continuing. It will take times to finish so that the authors plan to report the evolution of the early angiospermous pollen, the palynological biostratigraphy, the paleogeography and paleoclimate in the subsequent numbers of the series. The final complete report will include the pollen diagram, a checklist of the Cretaceous fossil flora and the discussion of past plant commumnity.

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MATERIALS AND METHODS

In this study, we collected Cretaceous core and cutting samples from 17 exploration wells in offshore of Taiwan and Peikang areas. These wells are numberd as YKL-3, YKL-2, YKL-1, YTP-1, GH-1, PK-2, PK-3, HM-3, HP-1, MLN-1, YCI-1, YCI-2, YTN-1, YTN-2, YTN-6, YTN-4 and YPT-1 (Fig. 1). In these wells, a total of seventy-one conventional cores, thirty-two side-well cores and seventy-five cuttings were brought to the Chinese Pertroleum Corporation micropaleontological laboratory for the palynological study.

The extraction of fossil palynomorphs from rock samples followed the method of the second author (Huang, 1981), including the removal of silicates by 52%HF, removal of calcite and silica oxide by 30%HCl and removal of humic acid by 10%KOH. Heavy solution of ZnCl at specific gravity 1.8-2.2 for flotation rock samples, were collected 17 exploration wells.

Photomicrographs were taken with a Zeiss Universal microscope equipped with an automatic camera using Kodak Panatomic X (16 DIN) film. For indentification, the standard references such as Huang (1972, 1981), Jansonius and Hills (1976) and other relevant papers, such as Alvin (1982), Canright (1974), Chaw and Huang (1981), Huang and Huang (1984), Huang (1978a, b, c, 1979, 1981a, b), Huang and Tsou (1984), Shaw (1985), Shaw & Huang (1983), Traverse (1988), Kremp and Kawasaki (1972), Kremp, Spackman, Ames and Kovar (1957-1972) have been utilized. The fossil slides are catalogued and kept at the Micropaleontology Laboratory of Chinese Petroleum Corporation.

RESULTS

The pollen and spores were counted. The number of pteridophyteic spores is 4635; gymnospermous grains is 4259; angiospermous grains is 110 and non-indentified sporomorphs is 672. These grains were indentified and classified into the following taxa. One hundred and thirty four species of fossil sporomorphs belonging to fourty-five genera and ninty eight species of pteridophytic spores, eleven genera and twenty six species of gymnospermous grains, and two genera and ten species of angiospermous grains and one genus and one species of algal spores have been recorded. The taxonomic treatment of fossil palynomorphs is as below.

(I) PTERIDOPHYTA

KEY TO CLASSES

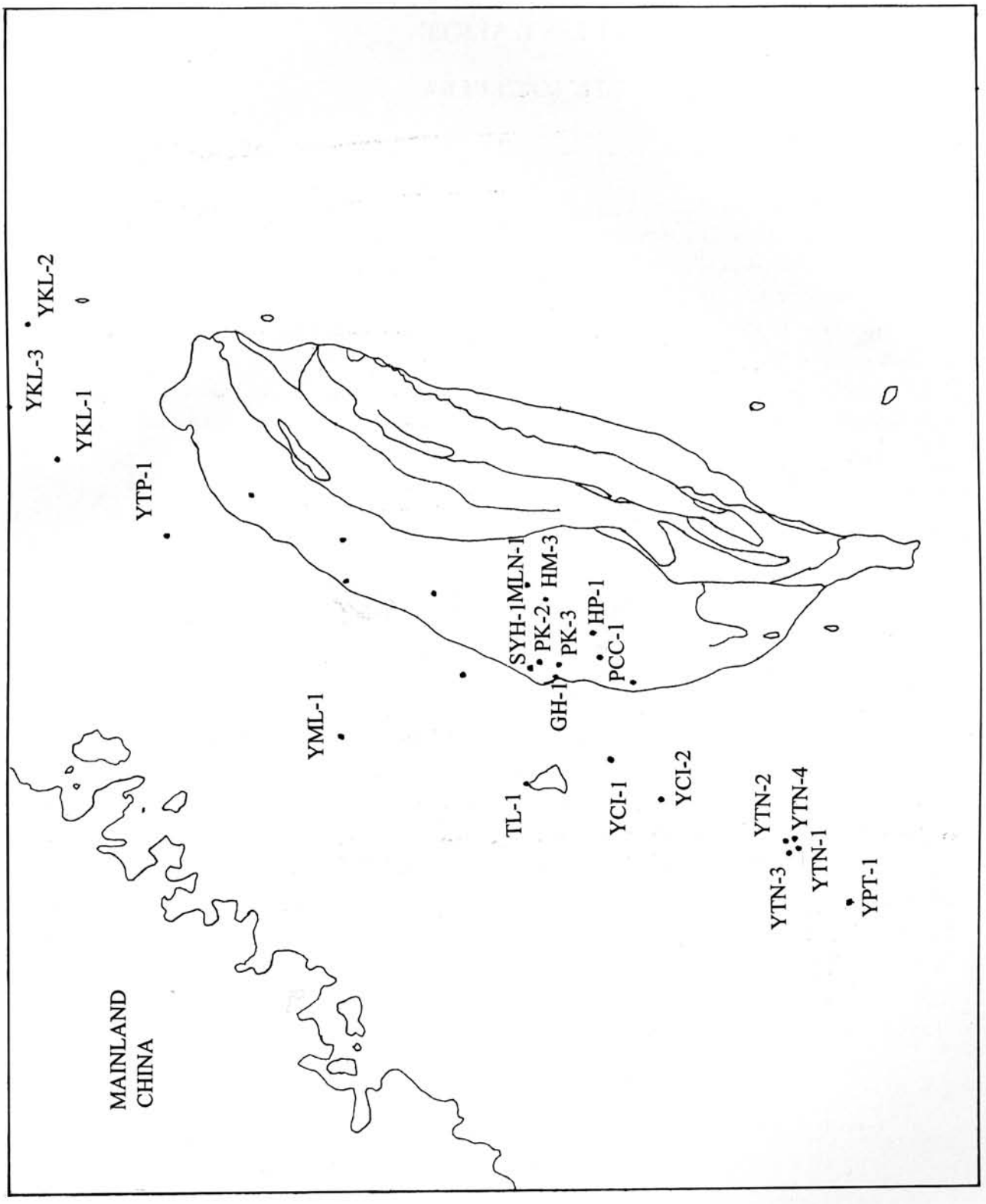

Fig. 1. Locality map of Taiwan area of wells mentioned in the present study.

1. Spores without dehiscent mark or tetrad scar..... 1. *Alete*
1. Spores with dehiscent mark or tetrad scar.
  2. Spores with a single tetrad scar..... 2. *Monolete*
  2. Spores with a triradiate tetrad scar..... 3. *Trilete*

CLASS 1. ALETE

KEY TO GENERA

1. Spores with perine..... 3. *Huangasporites*
1. Spores without perine.
  2. Spores exine smooth..... 4. *Laevigatasporites*
  2. Spores exine ornamented by various element.
    3. Lateral view of exine echinate..... 2. *Echinatinaperturites*
    3. Lateral view of exine not as above.
      4. Surface view of exine tuberculate, 1.5-3 μ wide..... 6. *Rubinella*
      4. Surface view of exine granulate, less than 1.1 μ wide.
        5. Lateral view of exine baculate to clavate..... 1. *Bacuinaperturites*
        5. Lateral view of exine scabrate..... 5. *Membranosphaera*

Genus 1. BACUINAPERTURITES Pierce 1961
圓柱紋無裂孢屬

Univ. of Minneosota, Minn. Geol. Surv., Bull. 42, p. 22, 42.
Type species:**BACUINAPERTURITES** Pierce
Diagnosis: Baculate, inaperturate sporomorphs.

(1) Bacuinaperturites taiwanensis Shaw & Huang *sp. nov.* Pl. 15; figs. 1-4.
台灣圓柱紋無裂孢
Spores inaperaturate; radial symmetrical, but occasionally split open; 16-25 μ wide. Surface view of exine granulate, 0.7-1.1 μ wide; lateral view of exine baculate to clavate, about 1.5-2 μ in length, 1 μ in width; exine 0.7-1 μ thick.
Holotype: Slide YPT-1 3786.37 -(4) ; Pl. 15; figs. 1,2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3786.37m in offshore south Taiwan, Lower Cretaceous.
Film: 92:29-27; 92:28-26; 95:36-28; 95:35-27.
Taxonomic affinity: Unknown.

Genus 2. ECHINATINAPERTURITES Shaw & Huang *gen. nov.*
刺紋無裂孢屬

Type species: *Echinatinaperturites echinatus* Shaw & Huang *sp. nov.*

Diagnosis: Miospores inaperturate; amb circular to oval. Surface view of exine irregular granulate; lateral view of exine echinate.

Key to species

1. Spores 26-36 μ wide..... (1.) *E. echinatus*
1. Spores 16-20 μ wide..... (2.) *E. taiwanensis*

(1) Echinatinaperturites echinatus Shaw & Huang *sp. nov.* Pl. 39; figs. 3, 4.
正刺紋無裂孢
Spores inaperturate; amb circular to quadrangular; 26-36 μ wide. Surface view of exine irregular granulate; lateral view of exine echinate, the echini 0.7x0.7 μ ; exine 0.5-1 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl. 41; figs. 3,4. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 118:4; 118:3.
Taxonomic affinity: Unknown.

(2) Echinatinaperturites taiwanensis Shaw & Huang *sp. nov.* Pl. 17; figs. 1, 2.
台灣刺紋無裂孢
Spores inaperturate; amb circular to oval; 16-20 μ wide. Surface view of exine irregular granulate; lateral view of exine echinate, the echini 0.5-1 μ long; exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3786.37-3786.39-(2); Pl. 17; figs.1,2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3786.37-3786.39m in offshore south Taiwan, Lower Cretaceous.
Film: 92:13-11; 92:14-12.
Taxonomic affinity: Unknown.

Genus 3. HUANGASPORITES Shaw 1994
黃氏孢屬

Taiwania 39(1-2): 56-58.
Type species: *Huangasporites taiwanensis* Shaw

Key to Species

1. Body 31-43 μ wide..... (1) *H. parvus*
1. Body 44-59 μ wide..... (2) *H. taiwanensis*

(1) Huangasporites parvus Shaw in Taiwania **39**(1-2): 56. pl. 1. figs. 1-3.

小黃氏孢

(2) Huangasporites taiwanensis Shaw in Taiwania **39**(1-2): 56. pl. 1. figs. 4-7.
台灣黃氏孢

Genus 4. LAEVIGATASPORITES Potonie & Gekketich 1933
平滑無裂孢屬

Sitz-Ber. ges. Naturf. Freunde, Bd. 33, p. 520
Type species: *Laevigatasporites magnus* (Pot.) Potonie & Gelletich.
Diagnosis(1933): Spores lacking a dehiscent scar and having a more or less smooth surface.

(1) Laevigatasporites irregularis Shaw & Huang *sp. nov.* Pl. 49; fig. 6
不規則平滑無裂孢
Spores alete; amb round triangular to crumpled circular shape; about 36-42 μ wide. Lateral view of exine psilate; surface view of exine smooth. Exine about 1 μ thick.
Holotype: Slide YTN-1 3702.54-(1); Pl. 49; fig. 6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3702.54m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 85:30-7.
Taxonomic affinity: It is possibly related to the extant species of *Equisetum*.

Genus 5. MEMBRANOSPHAERA Samoilovich in Samoilovich & Mchedlishvili 1961
膜質無裂孢屬

Pollen and Spores of Western Siberia; Jurassic-Paleocene. Leningrad, Trudi VNIGRI, vip. 177, p. 251
Diagnosis: Spores alete, sometimes ragged, of round or ellipsoidal shapes, very thin, rarely thick, easily crumpling, covered with small tubercles which occasionally have on their tops a thin pellicular layer and less frequently spiny or almost smooth.

Key to species

1. Lateral view of exine psilate..... (1.) *M. rugosa*
1. Lateral view of exine scabrate..... (2.) *M. taiwaniana*

(1) Membranosphaera rugosa Shaw & Huang *sp. nov.* Pl. 44; figs. 1, 2
散條紋膜質無裂孢
Spores alete; amb subcircular to oval; 36-43 μ Surface view of exine smooth, easily crumpling; lateral view of exine psilate; exine about 0.5 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(0); Pl. 44; figs. 1,2. CPC Micropaleontology

Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 116:22; 116:23.
Taxonomic affinity: Unknown.

(2) Membranosphaera taiwaniana Shaw & Huang *sp. nov.* Pl. 44; figs. 8, 9
台灣膜質無裂孢
Spores alete; amb subcircular to oval; 26-33 μ . Surface view of exine finely granulate, 0.2-0.3 μ wide; lateral view of exine scabrate; exine thin, 0.5 μ or less.
Holotype: Slide YTN-1 3712.96-(1); Pl. 44; figs. 8,9. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3712.96m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 91:31-26; 91:30-25.
Taxonomic affinity: Unknown.

Genus 6. RUBINELLA Maljavkina 1949 *ex* 1953
瘤紋無裂孢屬

1953 Trudy VNIGRI, n. ser., vyp. 75, p. 120
Type species: *Rubinella bacciformis* Malj.
Diagnosis: Equator circular, trilete mark not visible; overall shape like a raspberry, i.e. exine covered with closely spaced kernels, consequently outline indented.

(1) Rubinella taiwaniana Shaw & Huang *sp. nov.* Pl. 38; figs. 9-11
台灣瘤紋無裂孢
Spores alete, 22-29 μ wide; amb circular to oval. Surface view of exine tuberculate, 1.5-3 μ wide;lateral view of exine verrucate to papillate processes; exine 0.5-1 μ thick.
Holotype: Slide YTN-1 3711.01-(5); Pl. 38; figs. 9,10. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Crtaceous.
Film: 86:42A-20; 86:43A-21; 86:11A-33.
Taxonomic affinity: It is possibly related to the extant species of Osmundaceae (Jansonius & Hill 1976).

CLASS 2. MONOLETE

KEY TO GENERA

1. Spores exine striate..... 1. *Cicatricososporites*
1. Spores exine smooth..... 2. *Laevigatosporites*

Genus 1. CICATRICOSOSPORITES Pflug & Thomson in Thomson & Pflug 1953
肋紋單裂孢屬

Palaeontographica, Abt. B, Bd. 94, p. 61
Type species: *Cicatricososporites eocenicus* (Sell.) Pflug & Thomson.
Diagnosis: In the "division Monoletes Ibrahim", Thomson & Pflug gives this diagnosis: " cicatricose or canaliculate sculpture or structure."

(1) Cicatricososporites taiwanensis Shaw & Huang *sp. nov.* Pl.10; figs. 1,2
台灣肋紋單裂孢
Spores monolete, about 29 x 46 μ ; equatorial view bean shape. Laesural arms 25 μ long, with somewhat membrane-like protrudings. Surface view of exine striate, ribs 1-1.5 μ wide, grooves about 0.5 μ . Lateral view of exine irregular verrucate. Exine about 1 μ thick.
Holotype: Slide YTN-1 3710.72-3710.84-(4); Pl. 10; figs. 1-2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3710.72-3710.84m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 41:35-37; 41:36-38.
Taxonomic affinity: Unknown.

Genus 2. LAEVIGATOSPORITES Ibrahim 1933
平滑單裂孢屬

Dissertation 1933, p. 39
Type species: *Laevigatosporites vulgaris* (Ibr.) Ibrahim
Diagnosis: Spores monolete; amb bean shaped with a more or less straightened elongate dehiscent mark. Exine psilate, smooth.

Key to species

1. Spores more than 23 μ long..... (1.) *L. gracilis*
1. Spores less than 23 μ long..... (2.) *L. minor*
2. The ratio between length and width of spores more than 1.8..... (4.) *L. sinensis*
2. The ratio between length and width of spores less than 1.8.
3. The ratio between length and width of spores more than 2.2..... (3.) *L. nudum*
3. The ratio between length and width of spores less than 2.2.

(1) Laevigatosporites gracilis Wilson & Webster 273/4. fig. 4(17-30 μ). Fort. Union Kohle, Montana, U.S.A. 1964. Pl. 36; figs.1-5
小形平滑單裂孢
Spores monolete; amb lunate, the proximal face straight to concave, the distal face convex; 17-20x27-30 μ . Surface view of exine smooth; lateral view of exine psilate; exine 0.5-1 μ thick.

Slide: YPT-1 3794.07-3794.09-(1); Pl. 36; figs.1,2; CPC Micropaleon-tology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 91:16-13; 91:17-14; 92:37; 99:15-8; 93: 23-21.
Taxonomic affinity: It may be related to the extant species of *Asplenium* or *Parathelypteris*.

(2) Laevigatosporites minor Shaw & Huang *sp. nov.* Pl. 36; figs. 6-9
特小形平滑單裂孢
Spores trilete; amb lunate, the proximal face concave, the distal face convex; 11-15x17-21 μ. Surface view of exine smooth; lateral view of exine psilate; exine about 0.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 36; figs.8,9; CPC Micropaleon-tology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 98:22-; 98:23; 99:20-13; 99:21-14.
Taxonomic affinity: It may be related to the extant species of Polypodiaceae.

(3) Laevigatosporites nudum Shaw & Huang *sp. nov.* Pl. 37; figs. 1-4
光亮平滑單裂孢
Spores monolete, 15-17x34-37 μ ; equatorial view lunate, the proximal face flat, the distal face convex. Laesural with simple commissure,15-22 μ long. Surface view of exine smooth, lateral view of exine psilate, exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 37; figs.1,2; CPC Micropaleon-tology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:17-14; 93:36-29; 97:36-29; 98:35-28.
Taxonomic affinity: It may be related to the extant species of *Psilotum.*

(4) Laevigatosporites sinensis Shaw & Huang *sp. nov.* Pl. 37; figs. 5-8
中國平滑單裂孢
Spores monolete, 20-22x39-43 μ ; with bilateral symmetry, lateral view bean shape. Laesural 22-26u long. Surface view of exine smooth , lateral view of exine psilate, exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3790.48-3790.50-(1); Pl. 37; figs.5,6; CPC Micropaleon-tology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3790.48-3790.50m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 92:31-29; 92:30-28; 98:17-10; 98:18-11.
Taxonomic affinity: It may be related to the extant species of Polypodiaceae.

CLASS 3. TRILETES

KEY TO GENERA

1. Spores zonotrilete.
  2. Surface view of exine granulate..... 1. *Aequitriradites*
  2. Surface view of exine rugulate..... 31. *Triangulatisporites*
1. Spores azonotrilete.
  3. Polar axis longer than equatorial axis..... 34. *Triplanosporites*
  3. Polar axis shorter than equatorial axis.
    4. Perine present..... 10. *Crybelosporites*
    4. Perine abscent.
      5. Exine smooth to obscure pattern and not ornamented by various elements.
        6. Laesural arms simple.
          7. Amb triquete to trilobe.
            8. Amb triquete..... 12. *Cyathidites*
            8. Amb trilobe..... 11. *Cyatheidites*
          7. Amb deltoidal to rounded triangular.
            9. Amb rounded triangular..... 22. *Leiotriletes*
            9. Amb deltoidal triangular..... 13. *Deltoidospora*
        6. Laesural arms with flange-like, lip-like to line-like margo.
          10. Lateral view of exine psilate to subpsilate; laesural arms with flange-like to,lip-like margo..... 2. *Biretisporites*
          10. Lateral view of exine scabrate; laesural arms with line-like margo..... 30. *Scabratisporites*
      5. Exine ornamented by various elements.
        11. Exine striate.
          12. Striae only at apices..... 26. *Praemerosisporites*
          12. Striae at whole area..... 5. *Cicatricosisporites*
        11. Exine not striate.
          13. Proximal ridges present..... 16. *Gleicheniidites*
          13. Proximal ridges abscent.
            14. Surface view of exine finely reticulate, reticulate to lopho-reticulate.
              15. Lateral view of exine echinate..... 28. *Retitriletes*
              15. Lateral view of exine coniculate..... 21. *Klukisporites*
              15. Lateral view of exine verrucate..... 8. *Corrugatisporites*
              15. Lateral view of exine subpsilate to scabrate..... 17. *Hymenoreticulisporites*
            14. Surface view of exine not reticulate.
              16. Surface view of exine finely granulate, granulate, tuberculate to aerolate.
                17. Lateral view of exine verrucate, gemmate to papillate.
                  18. Amb circular, rounded to subtriangular.
                    19. Surface view of exine tuberculate.
                      20. Lateral view of exine papillate..... 27. *Rarituberisporites*
                      20. Lateral view of exine verrucate.
                        21. Amb circular to round-triangular..... 3. *Canaliculatisporites*
                        21. Amb triquete to subtriangular..... 35. *Tuberositriletes*
                    19. Surface view of exine finely granulate, granulate, to aerolate.
                      22. Spores exine more than 2 μ thick..... 32. *Triassisporis*
                      22. Spores exine less than 2 μ thick.

23. Surface view of exine aerolate..... 23. *Leptolepidites*
23. Surface view of exine finely granulate to granulate.
24. Spores less than 25 μ wide..... 20. *Kewaneesporites*
24. Spores more than 25 μ wide.
25. Granules less than 1 μ wide..... 24. *Osmundacidites*
25. Granules more than 1 μ wide.
26. Lateral view of exine verrucate..... 35. *Verrucosisporites*
26. Lateral view of exine gemmate..... 15. *Gemmatriletes*
18. Amb trilobate to triquete.
27. The sculptural elements largest and concentrated at apices, at other parts they are relatively smaller and more sparsely distributed..... 19. *Impardecispora*
27. The sculptural elements evenly distributed..... 6. *Concavissimisporites*
17. Lateral view of exine not as above.
28. Exine with echinate or pilose processes.
29. Spores less than 30 μ wide..... 14. *Echinatisporites*
29. Spores more than 30 μ wide..... 25. *Pilosisporites*
28. Exine with subpsilate to scabrate processes.
30. Amb circular to rounded triangular..... 36. *Undulatisporites*
30. Amb subtriangular to triquete ..... 17. *Granulatisporites*
16. Surface view of exine not as above.
31. Lateral view of exine verrucate.
32. Spores trilete with ring-like valvae at the radial corners..... 34. *Trilobosporites*
32. Spores distal face ornamented by concentric and radial bands..... 29. *Staplinisporites*
31. Lateral view of exine not as above.
33. Surface view of exine rivulate..... 9. *Costatisporites*
33. Surface view of exine rugulate..... 4. *Cibotumspora*
33. Surface view of exine extervermiculate to convolute..... 7. *Convolutispora*

Genus 1. AEQUITRIRADITES Delcourt & Sprumont 1955
愛葵三裂孢屬

Mem. Soc. beige., n. s. in 4° , no. 5, p. 44
Type species: *Aequitriradites dubius* Delc. & Sprum.
Diagnosis: Spore characterized by a wide membrane surrounding the central body; trilete rays extend (almost) to the margin of the membrane.

Key to species

1. Spores less than 50 μ wide..... (1.) *A. specious*
1. Spores more than 50 μ wide..... (2.) *A. spinulosus* var. *taiwanensis*

(1) Aequitriradites specious Shaw & Huang *sp. nov.* Pl. 26;figs. 1-6

美形愛葵三裂孢

Spores trilete, with a membranous zona; polar view round triangular; about 40-45 μ wide. Laesural arms extending into the membranous zona; about 24-26 μ long. Equatorial ridge membranous annulate, about 5-6 μ wide. Exine about 1-1.5 μ thick. Surface view of exine granulate, about 0.7-1.5 μ wide.

Holotype: Slide YTN-1 3711.01-(4); Pl. 26; figs. 1,2. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01-37722.3m in YTN structure of offshore south Taiwan, Lower Cretaceous.

Film: 865:28A-6; 86:29A-7; 117-11; 117:12; 116:33; 116:34

Taxonomic affinity: It is possibly related to the extant species of *Selaginella*.

(2) Aequitriradites spinulosus (Cookson & Dettmann) Cookson & Dettmann var. **taiwanensis** Shaw & Huang *var. nov.* Pl. 4; figs. 8,9; Pl. 1; fig. 12.

台灣愛葵三裂孢

Spores trilete, with a membranous zona; polar view round triangular; about 58 μ wide. Laesural arms extending into the membranous zona; about 26-29 μ long. Equatorial ridge membranous annulate, about 9-10 μ wide, with finely irregular reticulate. Exine about 1.5 μ thick. Surface view of exine granulate, about 0.7-1.5 μ wide.

Holotype: Slide YTN-1 3711.01-(1); Pl. 4; figs. 8,9. CPC Micropaleontology Lab.

Stratigraphic occurrence: It's discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan, Lower Cretaceous.

Film: 85:10-31; 85:10-32; 85:24.

Taxonomic affinity: It is possibly related to the extant species of *Selaginella*.

Comment: This variety differs from the typical variety in by having smaller size(58 μ).

Genus 2. BIRETISPORITES Delcourt & Sprumont 1955

唇狀三叉裂孢屬

Mem. Soc. belge Geol., n.s. in 4, no. 5, p. 40

Type species: *Biretesporites potoniaei* Delcourt & Sprnmont

Emended diagnosis by Delcourt et al. 1963: Microsporites trilete with a triangular to subtriangular amb. Laesural enclosed within elevated lips which are upturned extensions of the proximal exine. Exine smooth or almost so.

Remarks: *Hymenophyllumsporites* is a jounior synonym (Delcourt *et al.*1963)

Key to species

1. Spores trilete; exine less than 2 μ thick.
   2. Spores less than 21 μ wide..... (1.) *B. crassimagosus*
   2. Spores 23-33 μ wide..... (2.) *B. cretaceous*
   2. Spores more than 60 μ wide..... (3.) *B. magnus*

1. Spores trilete; exine 2-3 μ thick.
   3. Spores less than 45 μ wide..... (4.) *B. taiwanensis*
   3. Spores more than 45 μ wide..... (5.) *B. vulgaris*

(1) Biretisporites crassimagosus Shaw & Huang *sp. nov.* Pl. 11; figs. 7-9
厚唇狀三叉裂孢
Spores trilete; amb circular to rounded triangular; 17-20 μ wides. Laesural arms with lip-like margo, 10-11 μ long, as long as the radius. Surface view of exine smooth; lateral view of exine psilate; exine 1 μ thick.
Holotype: Slide YTN-1 3711.01-(8); Pl. 11; figs. 7,8. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 87:32A-10; 87:33A-11; 84:33-10
Taxonomic affinity: Unknown.

(2) Biretisporites cretaceous Shaw & Huang *sp. nov.* Pl. 11; figs 5,6
白堊紀唇狀三叉裂孢
Spores trilete; amb circular to rounded triangular; 26-29 μ wides. Laesural arms with lip-like margo, 12-13 μ long, as long as the radius. Surface view of exine obscure pattern; lateral view of exine psilate; exine 1-1.5 μ thick.
Holotype: Slide YTN-1 3711.01-(7); Pl. 11; figs. 5,6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 87:26A-4; 87:27A-5.
Taxonomic affinity: Unknown.

(3) Biretisporites magnus Shaw & Huang *sp. nov.* Pl. 38; fig. 2
大唇狀三叉裂孢
Spores trilete; amb circular to rounded triangular; 61-86 μ wides. Laesural arms with lip-like margo, 29-31 μ long, about 3/4 of the radius. Surface view of exine smooth; lateral view of exine psilate; exine 1.5 μ thick.
Holotype: Slide YTN-1 3711.01-(1); Pl. 38; fig. 2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 85:16-37.
Taxonomic affinity: Unknown.

(4) Biretisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 16; figs. 5,6
台灣唇狀三叉裂孢
Spores trilete; amb circular to rounded triangular; 37-43 μ wides. Laesural arms with flange-like margo, 19-20 μ long, as long as the radius. Surface view of exine obscure pattern; lateral view of exine subpsilate; exine 2-2.5u thick.
Holotype: Slide YTN-1 3722.1-3722.3-(2); Pl. 16; figs. 5,6. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 117:8; 117:7.
Taxonomic affinity: Unknown.

(5) Biretisporites vulgaris Shaw & Huang *sp. nov.* Pl.1; figs. 8-10
常見唇狀三叉裂孢
Spores trilete; amb rounded triangular to subtriangular;48-50x55-65 μ . Laesural arms with lip-like margo, ca. 29 μ long. Surface view of exine obscure pattern; lateral view of exine subpsilate; exine 2.5-3 μ thick.
Holotype: Slide YTN-1 3711.01-(5); Pl. 1; figs. 8-10. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 86:44A-22; 86:1A-23; 86:5A-27
Taxonomic affinity: Unknown.

Genus 3. CANALICULATISPORITES Dybova & Jachowicz 1957
瘤紋三叉圓孢屬

Instytut geol., Prace, v. 23, p.118
Type species: *Canaliculatisporites bastionatus* Dyboba & Jachonicz.
Diagnosis: Amb view elliptical or rounded triangular; surface tuberculate (canaliculate); spores of medium and large size.

(1) Canaliculatisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 42; figs. 6-8
台灣瘤紋三叉圓孢
Spores trilete; amb circular to rounded triangular; 27-34 μ wide. Laesural arms about simple type, about 14 μ long. Surface view of exine tuberculate, about 2-3.5 μ wide; lateral view of exine verrucate; exine about 1.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(2); Pl. 42; figs.6-8; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 99:31-24; 99:32-25; 99:33-26.
Taxonomic affinity: Unknown.

Genus 4. CIBOTIUMSPORA Chang 1965
金狗毛孢屬

Acta Palaeontol. Sinica, V. 13, no. l, P. 164
Type species: *Cibotiumspora paradoxa* Maly. *ex* Chang
Diagnosis: The diameter of the spore is 20 to 40 μ , generally about 27 μ . The polar outline of the spore is triangular to convex. The surface of the exine is psilate or

granular, finely verrucate or finely reticulate. The trilete suture has simple and slender opening. The three radial lobes have folds that intersect the trilete suture orthogonally or diagonally.

(1) Cibotiumspora taiwaniana Shaw & Huang *sp. nov.* Pl. 14; figs. 10-13.
台灣金狗毛孢

Spores trilete; polar view subtriangular with sides straight angle round; about 17 μ wide. Laesural arms about 9-10 μ long, with simple to line-like margo, extending up to the angle tips. Lateral view of exine subpsilate to scabrate. Surface view of exine rugulate to finely reticulate. Exine about 0.5 μ thick.

Holotype: Slide YPT-1 3797.26-(1); Pl.14; figs. 10,11. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26m in offshore south Taiwan, Lower Cretaceous.

Film: 95:10-2; 95:11-3.

Taxonomic affinity: It is possibly related to the extant species of *Cibotium*.

Genus 5. CICATRICOSISPORITES Potonie & Gelletich 1933
環肋孢屬

Sitz-ber. Ges. Naturf. Freunde, Berlin, Jahrg. 1931(1932, but 1933 in Potonie 1956)

Type species: *Cicatricosisporites dorogensis* Potonie & Gelletich

Diagnosis: (Pocock 1965) Trilete spores with two-layered exine; nexine smooth and thinner than or as thin as, sexine, showing little tendency to thicken at the apices, ornamented with ribs of more or less regular width and height, canaliculate to cicatricose.

Key to species

1. Polar view triquete with concave sides..... (3.) *C. mundulus*
1. Polar view rounded triangular, subtriangular to deltoidal triangular.
  2. Surface view striate, more than 17 subparallel ribs on distal face.
    3. The ribs more than 1 μ wide..... (6.) *C. tersus*
    3. The ribs less than 1 μ wide..... (2.) *C. minor*
  2. Surface view striate, less than 17 subparallel ribs on distal face.
    4. The ribs more than 2 μ wide.
      5. Spores more than 40 μ wide..... (4.) *C. nankingensis*
      5. Spores less than 40 μ wide..... (5.) *C. rarustriatus*
    4. The ribs less than 2 μ wide.
      6. Spores more than 34 μ wide..... (1.) *C. communis*
      6. Spores less than 34 μ wide..... (7.) *C. vulgaris*

(1) Cicatricosisporites communis Shaw & Huang *sp. nov.* Pl. 9. figs. 5, 6.
一般環肋孢

Spores trilete; about 34-37 μ wide; equatorial view tripanal shape. Laesural arms 14 μ long. Surface view striate; the ribs about 1 μ thick, the grooves about 0.5 μ or

less; about 16 subparallel ribs on distal face. Exine verrucate processes.
Holotype: Slide YTN-1 3712.96-(2); Pl. 9. figs, 5,6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3712.96m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 91:32-30; 91:33-31.
Taxonomic affinity: It may be related to the extant species of *Anemia*.

(2) Cicatricosisporites minor (Bolch.) Pocock Pl. 8. figs. 1,2.
小環肋孢
Spores trilete; about 28-30 μ wide; polar view rounded triangular. Laesural arms about 11-14 μ long, with line-like margo. Surface view striate; the rib about 0.5-0.7 μ wide, the grooves 0.5 μ wide, about 19-21 subparallel ribs on distal face. Exine verrucate processes.
Slide: YPT-1 3797.26-3797,28-(2); Pl. 8; figs. 1,2. CPC Micropaleon-tology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 95:19-11; 95:18-10.
Taxonomic affinity: It may be related to the extant species of *Anemia*.

(3) Cicatricosisporites mundulus Shaw & Huang *sp. nov.* Pl. 31. figs. 5,6.
整齊環肋孢
Spores trilete; about 46x50 μ wide; polar view triquete with sides concave. Laesural arms about 24 μ long, with flange-like margo. Surface view striate; the rib about 1.5-2 μ wide, the grooves 0.5 μ wide about 11 subparallel ribs on distal face. Exine psilate, only angle portion with verrucate processes.
Holotype: Slide CFC-1 3722.1-3722.3-(1); Pl. 31; figs.5,6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well CFC-1 3722.1-3722.3m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 115:17-27; 115:18-28.
Taxonomic affinity: It may be related to the extant species of *Anemia*.

(4) Cicatricosisporites nankingensis (Zhang) Zhang Pl.6 figs. 1,2.
南京環肋孢
Spores Trilete; about 40-50 μ wide; polar view subtriangular to deltoidal triangular. Laesural arms about 24 μ long, margo 1.5 μ wide. Surface view striate,jointed at angles and forming 2-3 concentric ribs on proximal face, about 8 subparallel ribs on distal face; the grooves between the ribs about 1-1.4 μ wide. Exine verrucate processes.
Slide: YTN-1 3710.72-(3); Pl. 6; figs. 1.2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3710.72m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 41:24; 41:25.
Taxonomic affinity: It may be related to the extant species of *Anemia*.

(5) Cicatricosisporites rarustriatus Shaw & Huang *sp. nov.* Pl. 7, figs. 1-6.
稀條紋環肋孢
Spores trilete; about 32-41 μ wide; polar view subtriangular; equatorial view triplanal shape. Laesural arms 13-16 μ long. Surface view striate, jointed at angles and forming 3-4 concentric ribs; about 6-7 subparrallel ribs on distal face; the ribs about 2-3 μ wide; the grooves 1-2 μ wide. Exine verrucate processes in corner portion.
Holotype: Slide YPT-1 3790.48-3790.50-(5); Pl. 7; figs. 1,2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3790.48-3790.50m, in offshore south Taiwan, Lower Cretaceous.
Film: 98:21A-15; 98:22A-16; 87:16A-38; 98:41A -35; 98:40A-34;98:39A-33.
Taxonomic affinity: It may be related to the extant species of *Anemia*.

(6) Cicatricosisporites tersus (Kara-Mursa) Pocock Pl. 5, figs. 1-6.
整潔環肋孢
Spores trilete; About 36-43 μ wide; tetrahedral, radially symmetrical; polar view rounded triangular. equatorial view triplanal shape. Laesural arms straight 18-20 μ, margo 0.1-1 μ wide. Surface view striate, jointed at angles and forming 6-7 concentric ribs on proximal face, about 18 subparallel ribs on distal face; the grooves between the ribs about 0.5-0.7 μ wide. Exine verrucate processes.
Slide: YTN-1 3710.70-(1); Pl.5; figs. 1,2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discoverd from the core of the well YTN-1 3710.70m in YTN structure of offshore south Taiwan; Lower Crtaceous.
Film: 40:19-21; 40:20-22; 40:29-31; 41:3-5; 41:16-18; 41:6-8.
Taxonomic affinity: It may be related to the extant spccies of *Anemia*.

(7) Cicatricosisporites vulgaris Shaw & Huang *sp. nov.* Pl. 6, figs. 3-8.
常見環肋孢
Spores trilete; about 26-34 μ wide; polar view subtriangular to rounded triangular; equtorial view triplanal shape. Laesural arms 8-14 μ long with line-like margo. Surface view striate; the ribs about 1-1.5 μ wide ; the grooves 0.5 μ wide; about 15 subparallel ribs on distal face. Exine verrucate processes.
Holotype: Slide YTN-1 3710.70-(3); Pl. 6; Fig. 4. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3710.70m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 41:8-10; 41:13-15; 85:17-38; 87:41A-18; 87:37A-15; 85:14-35.
Taxonomic affinity: It may be related to the extant species of *Anemia*.

Genus 6. CONCAVISSIMISPORITES Delcourt & Sprumont 1955
凹邊孢屬

Mem., Soc. belge Geol., n. s. in 4° , no. 5, p. 25.

Type species: *Concavissimisporites verrucosus* Dech. & Spr.

Emended diagnosis(by Pocock 1965): Spores trilete, triangular with somewhat concave to concave sides and well rounded apices. Exine two layered, with fairly evenly disposed sexine ornament on both proximal and distal faces which varies from subgranulose to verrucose.

Key to species

1. Laesural arms simple type..... (1.) *C. lepidus*
1. Laesural arms with flange-like margo.
   2. Surface view of exine obscurely granulate..... (2.) *C. speciosus*
   2. Surface view of exine finely areolate..... (3.) *C. taiwanensis*

(1) Concavissimisporites lepidus Shaw & Huang *sp. nov.* Pl. 9; figs. 3,4; Pl. 11; figs. 3,4.

雅美凹邊孢

Spores trilete, 35-37x41-57 μ ;amb triquete with sides slightly concave. Laesural arms simple type, 14-15 μ long. Surface view of exine finely granulate, 0.2-0.5 μ wide; lateral view of exine scabrate; exine 0.5-1 μ thick.

Holotype: Slide YPT-1 3797.26-3797, 28-(1); Pl. 9; figs.3,4. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan, Lower Cretaceous.

Film: 94:28A-20; 94:27A-19.

Taxonomic affinity: Unknown.

(2) Concavissimisporites speciosus Shaw & Huang *sp. nov.* Pl. 2; figs. 9,10

美形凹邊孢

Spores trilete, 48-66 μ wide; amb triquete with sides slightly concave. Laesural arms with flange-like margo; about 23 μ long. Surface view of exine obscure granulate; lateral view of exine flat verrucate; exine thick, about 1.5 μ thick.

Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl. 2; figs. 9,10 CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.

Film: 118:31; 118:30.

Taxonomic affinity: Unknown.

(3) Concavissimisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 2; figs. 5-8/ Pl. 30; figs. 3,4

台灣凹邊孢

Spores trilete, 41-60 μ wide; amb triquete with sides slightly concave. Laesural arms with distinct or indistinct flange-like margo; about 18-20 μ long. Surface view of exine finely areolate, ca. o.5-1 μ wide; lateral view of exine finely verrucate; exine about 1.5 μ thick.

Holotype: Slide YTN-1 3722.1-3722.3-(3); Pl. 2; figs. 5,6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 117:35; 117:34; 117:32; 117:31
Taxonomic affinity: Unknown.

Genus 7. CONVOLUTISPORA Hoffmeister, Staplin & Malloy 1955
交錯條紋三叉裂孢屬

J. Pal., v.29, no. 3, P. 384. 130, p. 55
Type species: *Convolutispora florida* Hoffmeista, Staphin & Malloy
Diagnosis: Spores radial, trilete; circular to subcircular; ornamentation closely packed overlapping anastomosing vermiculate or obervermiculate ridge-like processes, often causing a convoluted or coarsely reticulate-punctate appearance; trilete rays short, usually simple, but may have distinct lips, often obscured by the overlapping ridges; spore coat thick.

(1) Convolutispora formosana Shaw & Huang *sp. nov.* Pl. 24; figs. 6-8
台灣交錯條紋三叉裂孢
Spores trilete; amb rounded triangular with sides convex; 25x29 μ . Laesural arms with flange-like margo, 10-11 μ long. Surface view of exine extervermiculate to convolute; lateral view of exine coniculate; exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3794.07-3790.09-(4); Pl. 24; figs.6-8; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 99:23-16; 99:22-15; 99:24-17.
Taxonomic affinity: Unknown.

Genus 8. CORRUGATISPORITES Thomson & Pflug 1953
脊凹紋三叉裂孢屬

Palaeontographica, Abt. B, Bd. 94, p. 55
Type species: *Corrugatisporites solidus* (Potonie) Thomson & Pflug
Diagnosis: Trilete spores, without equatorial differentiation; sculpture elements elongate in basal outline, consisting of laterally fused verrucae, regularily or irregularly distributed.

Key to species

1. Spores more than 50 μ wide, surface view of exine finely reticulate..... (1.) *C. formatus*
1. Spores less than 50 μ wide, surface view of exine lopho-reticulate..... (2.) *C. taiwanensis*

(1) Corrugatisporites formatus Shaw & Huang *sp. nov.* Pl. 2; figs. 1,2
美形脊凹紋三叉裂孢
Spores trilete; amb rounded triangular to subtriangular; about 52-64 μ wide. Laesural arms 18-20 μ long; with line-like margo. Surface view of exine finely reticulate or pseudo-granulate; lateral view of exine finely verrucate; exine 1-2 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 2; figs.1,2; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:25-22; 93:24-21.
Taxonomic affinity: Unknown.

(2) Corrugatisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 22; figs. 3-6/Pl. 53; figs. 5,6.
台灣脊凹紋三叉裂孢
Spores trilete; amb subtriangular to rounded triangular; 38-45 μ wides. Laesural arms 20-21u long, with flange-like margo. Surface view of exine lopho-reticulate; lateral view of exine large irregular verrucate; exine 3 μ thick.
Holotype: Slide YTN-1 3712.96-(2); Pl. 22; figs. 3-6; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3712.96m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 91: 34-31; 91:33-32; 91:29-26.
Taxonomic affinity: Unknown.

Genus 9. COSTATISPORITES Shaw & Huang *gen. nov.*
徑肋紋三叉裂孢屬

Type species: *Costatisporites taiwanensis* Shaw & Huang *sp. nov.*
Diagnosis: Spores azonotrilete; polar view round triangular. Laesural arms with line-like to flange-like margo. Exine papilate or round verrucate; sexine rivulate.

(1) Costatisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 14 figs 4,5.
台灣徑肋紋三叉裂孢
Spores trilete, polar view round triangular, 16-21 μ wide; Laesural arms 8-9 μ long, with line-like margo, the margo less than 1 μ thick. Lateral view of exine remotely finely papillate; surface view of exine rivulate. Exine thin about 0.5 μ thick.
Holotype: Slide YTN-1 3700.7-(2); Pl. 14; figs. 4,5 CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3700.7m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 91:4-1; 91:5-2.
Taxonomic affinity: Unknown.

Genus 10. CRYBELOSPORITES Dettmann 1963
膜瓣漂浮孢屬

Proc. Roy. Soc. Victoria, n.s., v. 77, pt. 1. p.80
Type species: *Crybelosporites striatus* (Cooks. & Dettmann) Dettmann
Diagnosis: Trilete miospores, spheroidal to ellipsoidal; exine stratified, consisting of a smooth, homogeneous, inner layer enclosed within a two-layer, proximally cavate, structured 'sculptine'; outer layer of sculptine without a trilete aperture; proximally detached from trilete, inner layers; and with a reticulate, rugulate, or foveolate surface pattern.

(1) Crybelosporites taiwanensis Shaw & Huang *sp. nov.* Pl. 33; figs. 1-6 & Pl. 39; figs. 5,6
台灣膜瓣漂浮孢
Spores trilete or alete; spheroidal to ellipsoidal; 33-38 μ wide with a proximally cavate. Laesural arms indistinct. Surface view of perine rugulate; lateral view of the perine irregular verrucate to scabrate; the perine-like proximally cavate may extend up to 42 μ high. Spore body wall ca. 1-2 μ thick.
Holotype: Slide YPT-1 3797.26-3797.28-(3); Pl. 39; figs. 5,6; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 94:25A; 94:26A; 116:1; 116:2; 115:24-34; 115:23-33.
Taxonomic affinity: Unknown.

Genus 11. CYATHEIDITES Maljavkina 1958
凹邊三叉裂孢屬

Trudy vnigri, vip. 119, p. 57
Type species: *Cyatheidites trifurcus* Maljavkima
Diagnosis: Spore outline arrow-like lobate, lobes prominent, stretched; spore corners round, less frequently-slightly pointed; lateral sides strongly pressed in; exine smooth or with small radial crumples. Trilete slit simple.

Key to species

1. Exine less than 1 μ thick
   2. Spores less than 25 μ ..... (1.) *C. formosus*
   2. Spores more than 25 μ ..... (2.) *C. orientalis*
1. Exine more than 1.5 μ thick..... (3.) *C. taiwanensis*

(1) Cyatheidites formosus Shaw & Huang *sp. nov.* Pl. 15; figs. 5, 6.
美形凹邊三叉裂孢
Spores trilete; about 19-21 μ wide; polar view trilobe with sides deeply concave.

Laesural arms simple type, about 8 μ long. surface view of exine obscure pattern; lateral view of exine psilate; exine 0.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(1); Pl. 15; figs. 5,6; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 99:11-4; 99:12-5.
Taxonomic affinity: Unknown.

(2) Cyatheidites orientalis Shaw & Huang *sp. nov.* Pl. 9; figs. 1,2
東方凹邊三叉裂孢
Spores trilete; about 29-35 μ wide; amb trilobe with sides deeply concave. Laesural arms simple type, about 14-16 μ long. Surface view of exine smooth; lateral view of exine psilate; exine about 1 μ thick.
Holotype: Slide YPT-1 3797.26-3797.28-(1); Pl. 9; figs. 1,2; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 95:13-5; 95:14-6.
Taxonomic affinity: Unknown.

(3) Cyatheidites taiwanensis Shaw & Huang *sp. nov.* Pl. 1; figs. 5-7.
台灣凹邊三叉裂孢
Spores trilete; about 48-70 μ wide; polar view trilobate with sides deeply concave. Laesural arm simple type, about 16-29 μ long. surface view of exine obscure pattern. Exine psilate, about 1.5 -2 μ thick.
Holotype: Slide YTN-1 3711.01-(3); Pl. 1; fig.6. CPC. Micropaleontology Lab.
Stratigraphic occurrence: It is descovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film:86:9A-31; 86:27A-5; 86:32A-10.
Taxonomic affinity: Unknown.

Genus 12. CYATHIDITES Couper 1953
微凹三叉裂孢屬

New Zealand Geol. Surv., Paleont. Bull. 22, p. 27
Type species: *Cyathidites australis* Couper
Diagnosis: Trilete miospores; amb triangular, corners broadly rounded, sides slightly concave; rays Y mark clearly defined, at least 2/3 radius; proximal and especially distal side convex; exine smooth.
Remarks: *Concavitriletes* is a junior synonym(G. von der Brelie,1964)

Key to species

1. Exine more than 1 μ thick.
   2. Surface view of exine obscure pattern, lateral view of exine subpsilate..... .....(1.) *C. crassimarginatus*
   2. Surface view of exine smooth; lateral view of exine psilate..... (3.) *C. minus*
1. Exine less than 1 μ thick
   3. Surface view of exine smooth, lateral view of exine psilate.
      4. Spores more than 30 μ wide..... (2.) *C. formosus*
      4. Spores less than 30 μ .wide..... (4.) *C. mundulus*
   3. Surface view of exine obscure pattern, lateral view of exine subpsilate..... (5.) *C. parvus*

(1) Cyathidites crassimarginatus Shaw & Huang *sp. nov.* Pl. 11; figs. 1,2
厚邊微凹三叉裂孢
Spores trilete; amb triquete with sides slightly concave, the angle broadly rounded, about 20 μ wides. Laesural arms 9 μ long, straight, simple. Exine psilate to subpsilate, 1-1.5 μ thick; sexine obscure pattern.
Holotype: Slide YTN-1 3711.01-(6); Pl. 11; figs. 1,2; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 86: 2A-24; 86:3A-25.
Taxonomic affinity: Unknown.

(2) Cyathidites formosus Shaw & Huang *sp. nov.* Pl. 10; figs. 3-6
美形微凹三叉裂孢
Spores trilete; amb triquete, the sides concave, the angle broadly rounded, about 34-43u wides. Laesural arms 14-15 μ long, straight, simple. Exine psilate, 0.5-1 μ thick; sexine smooth.
Holotype: Slide YTN-1 3710.70-(1); Pl. 10; fig. 4; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3710.70m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 41: 14-16; 41:1-3; 40:27-29; 40:28-39.
Taxonomic affinity: Unknown.

(3) Cyathidites minus Shaw & Huang *sp. nov.* Pl. 13; figs. 4-7
特小微凹三叉裂孢
Spores trilete; about 16-19 μ wide; amb triquete with sides slightly concave. Laesural arms simple type to with line-like margo; 7-8 μ long. Surface view of exine smooth; lateral view of exine psilate; exine thick, similar to equatorial ridge, about 1-2.5 μ thick.
Holotype: Slide YPT-1 3786.37-3786.39-(3); Pl. 13; figs. 6,7; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3786.37-3786.39m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 92:10-8; 92:9-7; 92:18-16; 92:19-17; 86 :3A-25.
Taxonomic affinity: Unknown.

(4) Cyathidites mundulus Shaw & Huang *sp. nov.* Pl. 17; figs. 7-10
整齊微凹三叉裂孢
Spores trilete; amb triquete, the sides concave, the angle broadly rounded, about 23-28u wides. Laesural arms 9-11 μ long, straight, simple. Exine psilate, 1 μ thick; sexine smooth.
Holotype: Slide YPT-1 3797.26-3797.28-(1); Pl. 17; figs. 7,8; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3797.28m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 94:22A-14; 94:21A-13; 98:27A-21; 98: 28A-22.
Taxonomic affinity: Unknown.

(5) Cyathidites parvus Shaw & Huang *sp. nov.* Pl. 13; figs. 1-3
小微凹三叉裂孢
Spores trilete; about 21-24 μ wide; amb triquete with sides slightly concave. Laesural arms simple type to line-like margo;8-10 μ long. Surface view of exine obscure pattern; lateral view of exine subpsilate; exine 0.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 13; figs.1,2; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:11-9; 93:12-10; 93:15-13.
Taxonomic affinity: Unknown.

Genus 13. DELTOIDOSPORA Miner 1935
三角孢屬

American Midland Naturalist, V. 16, p. 618
Type species: *Deltoidospora hallii* Miner
Diagnosis: Spores trilete;amb concavely triangular to subcircular; Y mark distinct, rays at least 2/3 radius; exine two-layered, smooth or infrapunctate, with or without exinal folds along the Y mark; 25-80 μ.

Key to species

1. Spores more than 50 μ wide..... (1.) *D. communis*
1. Spores less than 30 μ wide..... (2.) *D. parvus*

(1) Deltoidospora communis Shaw & Huang *sp. nov.* Pl. 1. fig. 11
常見三角孢
Spores trilete; polar view deltoidal triangular to subtriangular, the sides nearly straight or slightly convex, the angle obtuse; about 58-64 μ wides. Laesural arms simple type, about 33 μ long. Surface view of exine smooth; lateral view of exine

psilate, about 1 μ thick.
Holotype: Slide YTN-1 3702.75-3702.93m-(2); Pl.1; fig. 11. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3702.75-3702.93m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 84:26-3
Taxonomic affinity: Unknown.

(2) Deltoidospora parvus Shaw & Huang *sp. nov.* Pl.14; figs. 6,7
小三角孢
Spores trilete; polar view deltoidal triangular to subtriangular, the sides nearly straight or slightly convex, the angle rounded; about 18-20 μ wides . Laesural arms simple type, about 7-8 μ long. Surface view of exine smooth; lateral view of exine psilate, about 0.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09m-(1); Pl.14; figs.6,7. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan; Lower Cretaceous.
Film: 99:13-6; 99:14-7.
Taxonomic affinity: Unknown.

Genus 14. ECHINATISPORITES Krutzsch 1959
刺紋三叉裂孢屬

Geologie, Beih. 21-22, P. 132
Type species: *Echinatisporis longechinus* Krutzsch
Diagnosis: Convexly triangular to subcircular azonotrilete microspores, that are ornamented all over with spines; spore wall simple; some verrucate may be scattered amongst the spines; Y- mark mostly distinct, in part poorly differentiated.

(1) Echinatisporis taiwanensis Shaw & Huang *sp. nov.* Pl. 19; figs. 12-14
台灣刺紋三叉裂孢
Spores trilete, 15-23 μ wide; amb rounded triangular, angle portion occasionally emarginatus. Laesural arms with line-like margo, about 9 μ in length. Surface view of exine irregular granulate; lateral view of exine echinate, the echini 1x0.5 μ ; exine about 1 μ thick.
Holotype: Slide YPT-1 3797.26-3797.28-(4); Pl. 19; figs.12-14; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 96:11-4; 96:12-5; 96:13-6.
Taxonomic affinity: Unknown.

Genus 15. GEMMATRILETES Pierce 1961
珠紋三叉裂孢屬

Univ. Minnesota, Minn. Geol. Surv., Bull. 42, p. 20
Type species: *Gemmatriletes morulus* Pierce
Diagnosis: Gemmate trilete spores.

Key to species

1. Laesural arms with flange-like margo..... (1.) *G. crassimaginatus*
1. Laesural arms simple type..... (2.) *G. specious*

(1) Gemmatriletes crassimaginatus Shaw & Huang *sp. nov.* Pl. 23; figs. 5,6
厚邊珠紋三叉裂孢

Spores trilete; about 33x37 μ wide; amb rounded triangular with sides convex. Laesural arms 12-14 μ long, with flange-like margo. Surface view of exine granulate, 1-2 μ wide; lateral view of exine verrucate to gemmate processes; exine 2 μ thick.

Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl. 23; figs. 5,6. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.

Film: 118:17; 118:16.

Taxonomic affinity: Unknown.

(2) Gemmatriletes specious Shaw & Huang *sp. nov.* Pl. 23; figs. 1-4
美形珠紋三叉裂孢

Spores trilete; about 33-38 μ wide; amb rounded triangular with sides convex. Laesural arms 12-14 μ long, simple type. Surface view of exine granulate, 1.5-2 μ wide; lateral view of exine papilate to gemmate processes; exine 1 μ thick.

Holotype: Slide YTN-1 3722.1-3722.3-(5); Pl. 23; figs. 1,2. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.

Film: 120:31; 120:30; 117:25; 117:26.

Taxonomic affinity: It may be related to the extant species of *Selaginella*.

Genus 16. GLEICHENIIDITES Ross 1949, Krutzsch 1959
裡白孢屬

1959:Ggeologie, Beiheft 21-22, p. 111.
Type species: *Gleicheniidites senonicus* Ross.
Diagnosis: *Gleicheniidites* with only weak thickened equatorial sides and also mostly only weak proximal tori or even no proximal tori at all; no sculpture and usuallly no

significant structure of the spore wall.

Key to species

1. Spores less than 25 μ wide..... (1.) *G. orientalis*
1. Spores more than 25 μ wide..... (2.) *G. peikangensis*

(1) Gleicheniidites orientalis Shaw & Huang *sp. nov.* Pl. 13; figs. 9-12.
東方裡白孢
Spores trilete; polar view subtriangular to triquete; about 18-23 μ wide. Laesural arms 8-10 μ long, with narrow-band proximal ridges, the ridge about 1-2 μ wide. Lateral view of the exine psilate. Exine about 0.7 μ thick.
Holotype: Slide YPT-1 3786.37-(1); Pl. 13; figs. 9-10. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3786.37m in offshore south Taiwan, Lower Cretaceous.
Film: 91:37-34; 91:36-33; 96:19-12; 96:20-13.
Taxonomic affinity: It is possibly related to the extant species of Gleicheniaceae.

(2) Gleicheniidites peikangensis Shaw & Huang *sp. nov.* Pl. 53; figs. 7,8.
北港裡白孢
Spores trilete; polar view subtriangular to triquete; about 27-32 μ wide. Laesural arms 13-15 μ long, with narrow-band proximal ridges, the ridge about 1-2 μ wide. Lateral view of the exine psilate. Exine about 1 μ thick.
Holotype: Slide PK-2 1689-(4); Pl. 53; figs. 7,8; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-2 1689m in central part of western Taiwan, Lower Cretaceous.
Film: 106:32-27; 106:33-28.
Taxonomic affinity: It is possibly related to the extant species of Gleicheniaceae.

Genus 17. GRANULATISPORITES Ibrahlm 1933
顆粒紋三叉裂孢屬

Dissertation; p. 21
Type species: *Granulatisporites granulatus* Ibrahim
Diagnosis: Spores with a Y-mark, in which the surface shows a granular sculpture.

Key to species

1. Lateral view of exine subpsilate.
   2. Spores less than 27 μ wide..... (1.) *G. parvus*
   2. Spores more than 27 μ wide..... (3.) *G. taiwanensis*
1. Lateral view of exine verrucate..... (2.) *G. peikangensis*

(1) Granulatisporites parvus Shaw & Huang *sp. nov.* Pl. 15; figs. 9,10.

小顆粒紋三叉裂孢

Spores trilete; amb subtriangular to tirquete; 22-25 μ wide. Laesural arms simple to flange-like margo, 9-10 μ long. Surface view of exine finely granulate; lateral view of exine subpsilate; exine 0.5-1 μ thick.

Holotype: Slide YPT-1 3794.07-3794.09-(5); Pl. 15; figs.9,10; CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.

Film: 94:14A-6; 94:13A-5.

Taxonomic affinity: It may be related to the extant species of *Lindsaea*.

(2) Granulatisporites peikangensis Shaw & Huang *sp. nov.* Pl. 47; figs. 1-9.

北港顆粒紋三叉裂孢

Spores trilete; amb subtriangular to tirquete, 20-35x30-46 μ ; laesural arms simple, 6-15 μ long. Surface view of exine finely granulate; lateral view of exine verrucate; exine 0.5-1 μ thick.

Holotype: Slide PK-3 2032.90-2034.40-(1); Pl. 47; figs.1,2; CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well PK-3 2029.4-2031.24m in Peikang area of south Taiwan; Lower Cretaceous.

Film: A5:24A-12; A5:25A-13; A5:41A-29; A5:42A-30; A5:16A-4; A5:17A-5; A5:13A-1; A5: 14A-2; A5:15A-3.

Taxonomic affinity: It may be related to the extant species of *Lindsaea.*

(3) Granulatisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 15; figs. 7,8

台灣顆粒紋三叉裂孢

Spores trilete; amb subtriangular with sides slightly concave to slightly convex; 30-32 μ wide. Laesural arms simple to line-like margo, 13-14 μ long. Surface view of exine finely granulate; lateral view of exine subpsilate; exine o.5-1 μ thick.

Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 15; figs.7,8; CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.

Film: 93:7-5; 93:8-6.

Taxonomic affinity: It may be related to the extant species of *Lindsaea.*

Genus 18. HYMENORETICULISPORITES Doring 1964

膜網紋三叉裂孢屬

Geologie, Jahrg. 13, H. 9, p. 1109

Type species: *Hymenoreticulisporites altimuronatus* Doring

Diagnosis: Relatively large azonotrilete microspores with reticulate sculpture consisting of very narrow, hyaline muri which reach considerable height and enclose rather

large lumina.

(1) Hymenoreticulisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 27; figs. 1-4
台灣膜網紋三叉裂孢
Spores trilete, 36-46 μ in width; polar view rounded triangular with sides convex;laesural arms with line-like margo, as long as radius, about 18-20 μ long, surface view of the exine consist of very narrow hyaline muri, about 1 μ thick; perine light yellow, subpsilate to scabrate, 1.5-2 μ extending out from the spore wall.
Holotype: Slide YTN-1 3711.01-(4); Pl. 27; figs. 1-2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 86:36A-14; 86:38A-15; 117:16; 117:17.
Taxonomic affinity: Unknown.

Genus 19. IMPARDECISPORA Venkatachala et al. 1969
不等孢屬

Palaeobotanist, V. 17, p. 124
Type species: *Impardecispora apiverrucata* (Coup.) Venk. *et al.*
Diagnosis (combined from original diagnosis and description): Trilete spores; amb triangular usually trilobate with broadly rounded radial apices and more or less strongly concave sides; rays Y mark well developed; exine thick, ornamented with grana, verrucae, muri, etc.; sculptural elements largest and concentrated at apices, at other parts they are relatively smaller and more sparsely distributed.

Key to species

1. Polar view triquete, exine less than 2 μ thick..... (1.) *I. determinatus*
1. Polar view trilobate, exine more than 2 μ thick..... (2.) *I. apiverrucata* var. *taiwaniana*

(1) Impardecispora determinatus Shaw & Huang *sp. nov.* Pl. 2; figs. 11,12
完整不等孢
Spores trilete, 42x60 μ ; amb triquete with sides more or less strongly concave. Laesural arms, about 24-26 μ long, with laesural ridges. Surface view of exine tuberculate, largest and concentrated at angle portion, at other parts they are relatively small and sparsely distributed. Exine about 1.5 μ thick, with verrucate processes.
Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl.2; figs. 11,12 CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 118:34; 118:35.
Taxonomic affinity: It may be related to the extant species of *Lygodium*.

(2) Impardecispora apiverrucata (Couper) Venkatachala, Kar & Raza var. **taiwaniana** Shaw & Huang *var. nov.* Pl. 1, figs.1-4

台灣不等孢

Spores trilete, about 53-64 μ wide; polar view trilobate with sides deeply coneave. Laesural arms, about 22 μ long, with laesural ridges. Surface view of exine tuberculate,largest and concentrated in angle portion, at other parts they are relatively small and more sparsely distributed. Exine about 2-3 μ thick, with verrucate proceoses.

Holotype: Slide YTN-1 3711.01-(2); Pl. 1; figs. 1-3. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Crtaceous.

Film: 86:22A-0; 86:23A-1; 86:24A-2; 86:4A-19.

Taxonomic affinity: This species is closely related to *Lygodium floculoson* Martynava (Pokrovskay and Stelmak 1964).

Comment: This species differs from *I. apiverrucata* by having smaller size(53-64 μ).

Genus 20. KEWANEESPORITES Peppers 1970

半圓紋三叉裂小孢屬

Illinois State Geol. Surv., Bull. 93, p. 93

Type species: *Kewaneesporites reticuloides* (Kos.) Peppers

Diagnosis: Small radial, trilete miospores; amb circular, oval to roundly triangular; trilete rays rather distinct; lips, if present, are poorly developed; proximal and distal surface ornamented with verrucate to gemmate projections, somewhat reduced in region of suture; exine 1-2 μ thick. The thin membrane is distinctive.

Key to species

1. Exine with two kinds of granules.
   2. Surface view of exine granulate, more than 10 granules on one face; spores more than 18 μ wide..... (1.) *K. formosus*
   2. Surface view of exine granulate, less than 10 granules on one face; spores less than 18 μ .... (2.) *K. rarigranulatus*
1. Exine with one kind of granules.
   3. Spores less than 18 μ wide..... (3.) *K. rotundus*
   3. Spores more than 18 μ wide..... (4.) *K. taiwanensis*

(1) Kewaneesporites formosus Shaw & Huang *sp. nov.* Pl. 19, figs. 9-11

美形半圓紋三叉裂小孢

Spores azonotrilete; amb rounded triangular; 19-22 μ wide. Laesural arms straight 7-9 μ long. Surface view of exine granulate, granules 0.5-1 μ wide; lateral view of exine verrucate to gemmate; exine 0.5 μ thick.

Holotype: Slide YPT-1 3794.07 -(4); Pl. 19; figs. 9-11. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07m

in offshore south Taiwan, Lower Cretaceous.
Film: 93:34-32; 93:33-31; 93:35-33.
Taxonomic affinity: Unknown.

(2) Kewaneesporites rarigranulatus Shaw & Huang *sp. nov.* Pl. 19; figs. 5-8
稀半圓紋三叉裂小孢
Spores azonotrilete; amb rounded triangular; 14-17 μ wide. Laesural arms straight with line-like margo ; 6-8 μ long. Surface view of exine granules but very rare, usually less than 10, the granulars are 0.5-1 μ wide; lateral view of exine verrucate to gemmate or psilate; exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3797.26 -(4); Pl. 19; figs. 7,8.CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26m in offshore south Taiwan, Lower Cretaceous.
Film: 94:37-29; 94:36-28; 95:44-36; 95:1-37.
Taxonomic affinity: Unknown.

(3) Kewaneesporites rotundus Shaw & Huang *sp. nov.* Pl. 18; figs. 1-5
圓形半圓紋三叉裂小孢
Spores azonotrilete; amb circular to elliptic; 18-22 μ wide. Laesural arms curving to undulate; 6-9 μ long.Surface view of exine, two kinds of granules, one is 0.2-0.3 μ wide, the other kind is 1-1.4 μ wide; lateral view of exine verrucate to gemmate, size range 0.2-1.5 μ in width; exine thin, about 0.5 μ thick.
Holotype: Slide YPT-1 3786.37 -(3) ; Pl. 18; figs. 1-3.CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3786.37m in offshore south Taiwan, Lower Cretaceous.
Film: 92:20-18; 92:22-20; 92:21-19; 96:15-8; 96:14-7.
Taxonomic affinity: Unknown.

(4) Kewaneesporites taiwanensis Shaw & Huang *sp. nov.* Pl. 18; figs. 6-12 /Pl. 19; figs. 1-4
台灣半圓紋三叉裂小孢
Spores azonotrilete; amb circular to rounded triangular; 14-17 μ wide. Laesural arms not straight, curving to undulate; 8-9 μ long. Surface view of exine, two kinds of granules, one is 0.2-0.3 μ wide, the other is 0.5-1 μ wide; lateral view of exine verrucate to gemmate, size range 0.2-1 μ in width; exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3786.37 -(3) ; Pl. 18; figs. 8,9. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3786.37m in offshore south Taiwan, Lower Cretaceous.
Film: 95:37-29; 95:38-30; 92:23-21; 92:24-22; 91:13-10; 91:14-11; 93:26-24; 95:3-39; 95:2-38; 95: 33-25; 95:34-26
Taxonomic affinity: Unknown.

Genus 21. KLUKISPORITES Couper 1958
克魯奇孢屬

Palaeontographica, Bd. 103, Abt. B, p. 137
Type species: *Klukisporites varieqatus* Couper
Diagnosis: Spores trilete, laesurae long, about 3/4 radius, commissures raised, bordered by a margo; amb rounded trianguular; distal surface with foveolate or foveo-reticulate sculpture;contact area of proximal surface has greatly reduced sculpturing; exine thick.
The genus is intended for reception of dispersed spores of the type met within the Jurassic ferns *Klukia exilis* and *Stachypteris hallei* of Schizaeaceous ferns (Couper, 1958; Traverse, 1988).

Key to species

1. Spores less than 37 μ wide..... (1.) *K. speciosus*
1. Spores more than 37 μ wide..... (2.) *K. subrotundus*
2. Spores surface view of exine reticulate.
2. Spores surface view of exine lopho-reticulate..... (3.) *K. taiwanensis*

(1) Klukisporites speciosus Shaw & Huang *sp. nov.* Pl.20; figs. 1-5.
美形克魯奇孢
Spores trilete; about 26-36x32-36 μ in width; polar view rounded triangular. Laesural arms indistinct. Surface view of exine irregular reticulate, the muri 1.5-2.5 μ thick, the lumina 1-3 μ wide, 1-8 μ long; tectum with coniculate processes.
Holotype: Slide YPT-1 3794.07-3794.09-(1); Pl.20; figs 1,2. CPC Micropaleontology Lab.
Stratigaphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan; Lower Cretaceous.
Film: 91:15-12; 91:16-13; 94:18a-10; 99:9-3;99 :10-2.
Taxonomic affinity: It may be related to the extant species of Schizaeaceae.

(2) Klukisporites subrotundus Shaw & Huang *sp. nov.* Pl.25; figs. 5,6.
次圓形克魯奇孢
Spores trilete; about 37x42 μ ; polar view rounded triangular. Laesural arms with flange-like margo, about 17 μ long. Surface view of exine reticulate, the muri 1-2 μ thick, the lumina 2-4 μ wide; tectum with coniculate processes.
Holotype: Slide YTN-1 3703.5-3703.6-(1); Pl.25; figs 5,6. CPC Micropaleontology Lab.
Stratigaphic occurrence: It is discovered from the core of the well YTN-1 3703.5-3703.6m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 115:6-16; 115:5-15.
Taxonomic affinity: It may be related to the extant species of Schizaeaceae.

(3) Klukisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 25; figs. 1-4.
台灣克魯奇孢
Spores trilete; about 39-42 μ in width; polar view rounded triangular to subtriangular, equatorial view coni-hemispherical; Laesural arms with margo, about

14-15 μ long; surface view of exine lopho-reticulate, the muri 1.5-2.5 μ thick, the lumina 3-7 μ wide; tectum with coniculate processes.
Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl.25; figs 1,2. CPC Micropaleontology Lab.
Stratigaphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 118:24; 118:25; 117:36; 117:37.
Taxonomic affinity: It may be related to the extant species of Schizaeaceae.

Genus 22. LEIOTRILETES Naumova 1939 *ex* Ishchenko 1952
平滑徑三裂孢屬

Rept. Intern. Geol. Congr., 17 sess., Moscow 1937; v.l, p.355 1952 Akad. Nauk SSSR; Inst. Geol. Nauk; Atlas; p.9
Type species: *Leiotriletes sphaerotriangulus* (Loose) Potonie & Kremp
Diagnosis: Spores azonotrilete; amb rounded triangular, the sides usually convex; the angle rounded. Laesural arms simple, exine smooth, rarely infrapunctate.

Key to species

1. Amb rounded triangular.
  2. Radial arms uniformly one type.
    3. Surface view of exine smooth.
      4. Spores more than 30 μ wide.
        5. Laesural arms more than 15 μ long, exine ca. 1 μ thick..... (5.) *L. spaerotriangulus*
        5. Laesural arms less than 15 μ long, exine ca. 0.5 μ thick..... (1.) *L. communis*
      4. Spores less than 30 μ wide..... (7.) *L. wolffi*
    3. Surface view of exine obscure pattern..... (2.) *L. membranus*
  2. Radial arms not uniformly one type; amb one side convex and two sides slightly concave..... (3.) *L. obovatus*
1. Amb circular
  6. Spores more than 40 μ wide..... (6.) *L. taiwanensis*
  6. Spores less than 40 μ wide..... (4.) *L. rotundus*

(1) Leiotriletes communis Shaw & Huang *sp. nov.* Pl. 12; figs. 5,6
長見平滑徑三裂孢
Spoes trilete; amb rounded triangular with sides convex;36-38x34-47 μ . Laesural arms simple type, ca. 12-14 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 0.5 μ thick.
Holotype: Slide 3710.70-3710.82-(2); Pl. 12; figs 5,6. CPC Micropaleontology Lab.
Stratigaphic oceurrence: It is discovered from the core of the well YTN-1 3710.70-3710.82m in YTN structure of offshore south Taiwan; Lower Cretaceous.

Film: 41:20; 41:21.
Taxonomic affinity: Unknown.

(2) Leiotriletes membranus Shaw & Huang *sp. nov.* Pl. 16; figs. 1-2
膜質平滑徑三裂孢
Spores trilete; amb rounded triangular with sides convex;34x38 μ . Laesural arms simple type, ca. 15 μ long. Surface view of exine obscure pattern; lateral view of exine psilate; exine 0.5 μ thick.
Holotype: Slide 3722.1-3722.3-(4); Pl.16; figs 1,2. CPC Micropaleontology Lab.
Stratigaphic oceurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 119:1A; 119:0A.
Taxonomi caffinity: Unknown.

(3) Leiotriletes obovatus Huang in Taiwania **23:** 43. 1978; Pl. 45; figs. 9,10
廣卵形平滑徑三裂孢
Spores trilete; amb obovatus, one side convex, two sides slightly constricted at center; 52x68 μ wide. Laesural arms simple,24-26 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 1-1.5 μ thick.
Slide: PK-3 2036.1-2037.8m-(3); Pl. 45; figs. 9-10. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-3.2036.1-2037.8m in Peikang area of south Taiwan; Lower Cretaceous.
Film: A7:16A-32; A7:15A-31.
Taxonomic affinity: Unknown.

(4) Leiotriletes rotundus Shaw & Huang *sp. nov.* Pl. 15; figs. 11,12
圓形平滑徑三裂孢
Spores trilete; amb circular, 28-31 μ wide. Laesural arms simple, 11-12 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3794.07-3794. 09-(2); Pl. 15; figs.12; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:22-20; 93:4-2.
Taxonomic affinity: It may be related to the extant species of *Equisetum.*

(5) Leiotriletes sphaerotriangulus (Loose) Potonie & Kremp 1954; Pl. 45; figs. 3,4.
圓三角形平滑徑三裂孢
Ged. Jabrb., Bd. **69:** 120.
Spores trilete; amb rounded triangular, the sides slightly convex; 33-43x46-54 μ. Laesural arms simple, 16-24 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 1 μ thick.
Slide: PK-3 2008.48-2009.8m-(3); Pl. 45; figs. 3,4. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well PK-3.2008.48-2009.8m in Peikang area of south Taiwan; Lower Cretaceous.
Film: A6:19A-11; A6:18A-10.
Taxonomic affinity: Unknown.

(6) Leiotriletes taiwanensis Huang 1978; Pl. 45; figs. 7,8. in Taiwania **23:** 43.
台灣平滑徑三裂孢
Spores trilete; amb circular, 51-58 μ wide. Laesural arms simple, 17-19 μ long; surface view of exine smooth; lateral view of exine psilate; exine 1 μ thick.
Slide: YKL-1 2312-2315m-(1); Pl. 45; figs. 7-8. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YKL-1.2312-2315m in offshore of northern Chilung; Lower Cretaceous.
Film: A7:34A-6; A7:35A-7.
Taxonomic affinity: It may be related to the extant species of *Equisetum.*

(7) Leiotriletes wolffi Kr. subsp. **brevis** Kr. 1971; Pl. 45; figs. 5,6.
小烏氏平滑徑三裂孢
Spores trilete; amb round-triangular to subtriangular, 25-32 μ wide. Laesural arms simple, 10-11 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 0.5 μ thick.
Slide: YTP-1 1862m-(4); Pl. 45; figs. 5-6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTP-1 1862m in offshore of western Taipei; Lower Cretaceous.
Film: A8:44A-18; A8:1A-19.
Taxonomic affinity: Unknown.

Genus 23. LEPTOLEPIDITES Couper 1953
假網紋三叉裂孢屬

New Zealand Geol. Survey, Paleont. Bull. 22, p. 28
Type species: *Leptolepidites verrucatus* Couper
Diagnosis: Trilete spores; amb subtriangular, sides convex to concave; biconvex in side view; exine very thick, sculptured with large, irregularly shaped, verrucate projections, equally developed on proximal and distal surfaces; rays Y mark long but rather indistinct.

(1) Leptolepidites taiwanensis Shaw & Huang *sp. nov.* Pl. 20; figs. 6,7
台灣假網紋三叉裂孢
Spores trilete; amb rounded triangular; 19x34 μ. Laesural arms indistinct, about 4 μ long. Surface view of exine areolate, 2-3x4-5 μ; lateral view of exine large verrucate; exine 1-2 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(2); Pl. 20; figs. 6,7; CPC Micropaleon-

tology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 99:29-22; 99:30-23.
Taxonomic affinity: Unknown.

Genus 24. OSMUNDACIDITES Couper 1953
擬紫萁孢屬

New Zealand Geol. Surv., Paleontol. Bull. 22, p.20
Type species: *Osmundacidites wellmanii* Couper
Dignosis: Trilete spores, amb circular to subcircular; laesural arms moderately long; exine thin, granular to papillate, sculpture somewhat reduced on proximal face.

(1) Osmundacidites orientalis Shaw & Huang *sp. nov.* Pl. 8; figs. 3-9 / Pl. 17; figs. 11,12
東方擬紫萁孢
Spores trilete, 25-32 μ wide; amb circular to ellipsoidal. Laesural arms simple or indistinct, about 11 μ long. Surface view of exine finely granulate; lateral view of exine finely verrucate; exine 1 μ thick.
Holotype: Slide YPT-1 3797.26-3797.28-(3); Pl. 17; figs.11,12; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 91:12-9; 91:11-8; 91:10-7; 91:18-15; 91 :19-16; 91:40-37;91:41-38; 95:29-21; 95:28-20.
Taxonomic affinity: It may be related to the extant species of Osmundaceae.

Genus 25. PILOSISPORITES Delcourt & Sprumont 1955
刺毛孢屬

Mem. Soc. beige Geol., n. s. in 4° , na. 5, p. 34
Type species: *Pilosisporites trichopapillosus* (Thierg.) Delcourt & Sprumont
Diagnosis: Trilete microspores; amb. subtriangular, ornamented with hair-like, setae, papillae, etc. on all or part of the exine surface, but not restricted to the equator; all appendages single, not joined at their bases.

Key to species

1. Polar view trilobate to extremely concave.
  2. Pilose processes less than 4 μ long.
    4. The pilose processes concentrated and longer at angle part..... (1.) *P. parvus*
    4. The pilose processes not concentrated and not longer at angle part..... (2.) *P. paucipilosus*

2. Pilose processe more than 4 μ long.
3. Polar view extremely concave equatorial view triplanal ..... (4.) *P. triplanatus*
3. Polar view trilobate..... (5.) *P. verus* var. *formosensis*
1. Polar view subtriangular to triquete..... (3.) *P. taiwanensis*

(1) Pilosisporites parvus Shaw & Huang *sp. nov.* Pl. 3; figs. 4-8 / Pl. 30; figs. 1,2
小刺毛孢
Spores trilete, 39-43x58-63 μ ; amb trilobe with sides deeply ccncave. Laesural arms 20-23 μ long, with flange-like margo. Surface view of exine irregular granulate to rugulate. Exine about 1.5 μ thick; with pilose processes concentrated and longer at angle part, about 1.5-3 μ long.
Holotype: Slide YTN-1 3722.1-3722.3m-(5); Pl. 3; figs. 4-5. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 120:12; 120:11; 120:10; 120:9
Taxonomic affinity: It is possibly related to the extant species of *Lygodium.*

(2) Pilosisporites paucipilosus Shaw & Huang *sp. nov.* Pl. 3; figs. 12,13
稀毛刺毛孢
Spores trilete, 65x78 μ ; amb trilobe with sides deeply concave. Laesural arms about 28 μ long, margo indistinct. Surface view of exine irregularly granulate. Exine 1.5-2 μ thick; with pilose processes, about 1-2 μ long; not concentrated and not longer at angle portion.
Holotype: Slide YTN-1 3722.1-3722.3m-(1); Pl. 3; figs. 12,13. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 116:11; 116:12.
Taxonomic affinity: It is possibly related to the extant species of *Lygodium.*

(3) Pilosisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 3; figs. 1-3.
台灣刺毛孢
Spores trilete, about 60 μ wide; polar view subtriangular to triquete. Laesural arms simple type about 26 μ long. Surface view of the exine granulate. Exine about 1 μ thick; with filiform processes concentrated and longer at angle portions, about 5 μ in length, 0.5-1 μ in width.
Holotype: Slide YTN-1 3722.1-3722.3m-(1); Pl. 3; figs. 1-2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 116:10; 116:8; 120:19.
Taxonomic affinity: It is possibly related to the extant species of *Lygodium.*

(4) Pilosisporites triplanatus Shaw & Huang *sp. nov.* Pl.4; figs. 4-7

楊桃形刺毛孢

Spores trilete, 50-63 μ wide; amb extremely concave, equatorial view triplanal. Laesural arms about 20 μ long. Surface view of exine irregularly granulate to rugulate. Exine 1.5-2 μ thick; with pilose processes, concentrated and longer at angle portion, about 5 μ long.

Holotype: Slide YTN-1 3711.01-(7); Pl. 4; figs. 6,7. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.

Film: 85:8-29; 85:9-30; 86:15A-37; 86:16A-38.

Taxonomic affinity: It is possibly related to the extant species of *Lygodium*.

(5) Pilosisporites verus Delcourt & Sprumont var. **formosensis** Shaw & Huang *var. nov.* Pl. 3; figs 9-11; Pl. 4; fig. 1-3

寶島刺毛孢

Spores trilete, about 46-62x62-76 μ ; polar view trilobe with sides deeply concave. Laesural arms 21-28 μ long, with flange-like margo. Surface view of the exine irregular granulate to rugulate. Exine about 2 μ thick; with pilose processes concentrated and longer at the angle part, about 4-8 μ in length.

Holotype: Slide YTN-1 3711.01m-(4); Pl. 4; fig. 1. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.

Film: 118:8; 116:9; 87:8A-30

Taxonomic affinity: It is possibly related to the extant species of *Lygodium*.

Comment: This variety differs from the typical variety in having smaller size(46-62x62-76 μ).

Genus 26. PRAEMEROSISPORITES Shaw & Huang *gen. nov.*

角肋紋三叉裂孢屬

Type species: *Praemerosisporites taiwanensis* Shaw & Huang *sp. nov.*

Diagnosis: Spores azonosprites; amb extremely concave; laesural arms indistinct; striate processes only appearance at apices.

(1) Praemerosisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 31; figs. 3,4

台灣角肋紋三叉裂孢

Spores trilete; amb extremely concave; 40x40x28 μ . Laesural arms indistinct, about 14 μ long. Surface view of exine obscure pattern, striate processes only appearance at apices; lateral view of exine subpsilate to verrucate; exine 1 μ thick.

Holotype: Slide YTN-1 3722.1-3722.3-(5); Pl.31; figs. 3,4. CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.

Film: 120:34; 120:33.

Taxonomic affinity: Unknown.

Genus 27. RARITUBERISPORITES Shaw & Huang *gen. nov.*
稀瘤孢屬

Type species: *Rarituberisporites taiwanensis* Shaw & Huang *sp. nov.*
Diagnosis: Spores trilete; surface view of exine with scattered tubercules; exine thin and atectate.

(1) Rarituberisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 30; figs. 5,6
台灣稀瘤孢
Spores trilete; amb subtriangular; 41x52 μ . Surface view of exine with scattered tubercules, 4-6 μ wide; lateral view of exine psilate, occasionally with papillate processes; exine atectate, less than 0.5 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl.30; figs. 5,6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 118:20; 118:21.
Taxonomic affinity: Unknown.

Genus 28. RETITRILETES Pierce 1961
網紋徑三裂孢屬

Univ. Minnesota, Minn. Geol. Surv., Bull. 42, p.21
Type species: *Retitriletes glogosus* Pierce
Diagnosis: Spores azonotrilete; amb circular or rounded triangular; laesural arms usually long; exine with scabrate to echinate processes; sexine reticulate.

Key to species

1. Lumina less than 4 μ wide; the muri less than 0.5 μ thick..... (1.) *R. aerolatus*
1. Lumina more than 4 μ wide, muri more than 0.5 μ thick..... (2.) *R. cretaceous*

(1) Retitriletes aerolatus Shaw & Huang *sp. nov.* Pl. 21; figs. 1-5
假網紋徑三裂孢
Spores trilete; amb circular to rounded triangular; 28-38 μ wide. Laesural arms simple type, 12-14 μ long. Surface view of exine reticulate, the lumina about 3 μ wide, the muri about 0.2-0.3 μ thick; lateral view of exine slightly echinate; exine about 1 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(2); Pl. 21; figs.1-3; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-

3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 99:28-21; 99:27-20; 99:26-19; 99:16-9; 99:17-10
Taxonomic affinity: It may be related to the extant species of *Lycopodium.*

(2) Retitriletes cretaceous Shaw & Huang *sp. nov.* Pl. 31; figs. 1,2
白堊紀網紋徑三裂孢
Spores trilete, amb rounded triangular, 32-39 μ wide. Laesural arms about 12 μ long. Surface view of exine reticulate; the lumina hexagonal, 4 μ wide; the muri 0.5-1 μ thick. Lateral view of exine with echinate processes. Exine about 1 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(1); Pl.31; figs. 1,2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 116:9; 116:10.
Taxonomic affinity: It may be related to the extant species of *Lycopodium.*

Genus 29. SCABRATISPORITES Visscher 1966
粗糙三叉裂孢屬

Acta Botanica Neerlandica, v. 15, p. 328
Type species: *Scabratisporites scabratus* Visscher
Diagnosis: Spores trilete, azonal; amb approx, circular; exine ornamented with more or less regularly distributed scabrate; rays Y mark not extending to equator; usually folded.

(1) Scabratisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 16; figs. 3,4
台灣粗糙三叉裂孢
Spores trilete; amb circular to rounded triangular; 30-33 μ wide. Laesural arms somewhat undulate, 14-16 μ long. Surface view of exine obscure pattern; lateral view of exine scabrate; exine thin ca. 0.5 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl.16; figs. 3,4. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 117:8; 117:7.
Taxonomic affinity: Unknown.

Genus 30. STAPLINISPORITES Pocock 1962
史氏孢屬

Palaeontographica, Bd. 111, Abt. B, p. 49
Type species: *Staplinisporites caminus* (Balme) Pocock
Diagnosis: Trilete microspores with strongly developed raised commissures; equa-

torial outline triangular, sides convex; proximal exine thin, smooth to granulose; distal face ornamented by concentric and radial bands of exinal thickening, and frequently possesses a granulose thickened boss which may, however, become detached,leaving a thin granulose exinal area exposed.

(1) Staplinisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 32; figs. 1-6.
台灣史氏孢
Spores trilete; about 35 μ wide; polar view rounded triangular. Laesural arms about 17-19 μ long; extending into the angle tips; with raised lip-like margo. Distal face ornamented by concentric and radial bands; proximal face smooth. Exine about 1.5 μ thick, with verrucate processes.
Holotype: Slide YTN-1 3722.1-3722.3-(3); Pl. 32; figs. 3,4. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 117:27; 117:28; 116:4; 116:3.
Taxonomic affinity: Unknown.

Genus 31. TRIANGULATISPORITES Potonie & Kremp 1954
環膜三角孢屬

Geol. Jahrb., Bd. 69, p. 163
Type species: *Triangulatisporites triangulatus* (Zerndt) Potonie & Kremp
Diagnosis: Trilete megaspores with membranous zona; equatorial outline more or less triangular; curvaturae may be present, near the equtor; trilete rays relatively long, reaching at least to the margin of the central body; surface over central body proximally nearly smooth to granulate, distally variously reticulate (i.e. with more or less crowded depressions or lacunae, that may be undeveloped.).

(1) Triangulatisporites taiwanensis Shaw & Huang *sp. nov.* Pl. 28; figs. 1-6 / Pl. 27; figs. 5,6
台灣環膜三角孢
Spores trilete, 31-42 μ wide; amb rounded triangular with membranous zona, about 1-3 μ in width. Laesural arms straight to somewhat undulate, as long as radius and extending toward the margin of zona. Surface view of exine rugulate; exine about 1 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(5); Pl. 28; figs. 4-6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 116:15; 116:16; 116:17; 120:2; 120:3; 120:4.
Taxonomic affinity: Unknown.

Genus 32. TRIASSISPORIS Schulz 1965
三疊紀孢屬

Mitt. Zentr. Geol. Inst., Berlin, H. I, p. 258
Type species: *Triassisporis roeticus* Schulz
Diagnosis: Trilete microspores, amb subcircular to almost subtriangular; exine moderately thick, and all sides covered with verrucae that in part grow together and that are of variable size; verrucate show distinctly fine radial structure in side view; Y mark distinct.

(1) Triassisporis taiwaniana Shaw & Huang *sp. nov.* Pl. 24; figs. 3-5
台灣三疊紀孢
Spores trilete; amb circular to rounded triangular; 26-28 μ wide. Laesural arms with line-like margo, 10-11 μ long. Surface view of exine granulose to areolate; lateral view of exine verrucae; exine thick, about 2 μ or more.
Holotype: Slide YTN-1 3710.70-3710.82-(4); Pl. 24; figs. 3-5. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3710.70-3710.82m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 121:23; 121:25; 121:24.
Taxonomic affinity: Unknown.

Genus 33. TRILOBOSPORITES Pant 1954 *ex* Potonie 1956
三瓣孢屬

Beih. Geol. Jahrb., H. 23, p. 55
Type species: *Trilobosporites hannonicus* (Delcourt & Sprumont) Potonie
Diagnosis: Trilete miospores; amb triangular, sides straight to concave; exine finely sculptured, thickened at the radial corners (valvae); in type species the Y mark gaping, which cause the appearance of Kyrtoms.

Key to species

1. Amb not rounded triangular, less than 38 μ wide.
   2. Amb deldoid triangular, less than 27 μ wide..... (1.) *T. deltoidus*
   2. Amb trilobate, more than 27 μ wide..... (2.) *T. formosensis*
1. Amb rounded triangular, more than 38 μ wide..... (3.) *T. rotundus*

(1) Trilobosporites deltoidus Shaw & Huang *sp. nov.* Pl. 29; figs. 5-7
三角形三瓣孢
Spores trilete; amb deltoid triangular with sides straight and angle acute; 23x26 μ; ring-like valvae at the radial corners. Laesural arms as long as the radius, 16 μ long, with flange-like margo. Surface view of exine faint finely granulate, o.5 μ or less in width; lateral view of exine slightly verrucate; exine 1 μ thick.

Holotype: Slide YTN-1 3718.03-3718.08-(2); Pl. 29; figs. 5-7. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3718.03-3718.08m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 121:16; 121:17; 121:18.
Taxonomic affinity: It is possibly related to the extant species of *Lygodium.*

(2) Trilobosporites formosensis Shaw & Huang *sp. nov.* Pl.29; figs. 3,4
寶島三瓣孢
Spores trilete; amb trilobate with sides deeply concave;27x38 μ ; ring-like valvae at the radial corners. Laesural arms as long as radius, 19-20 μ long, with flange-like margo. Surface view of exine finely granulate, ca. 0.5 μ wide; lateral view of exine verrucate; exine 1-1.5 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(5); Pl. 29; figs. 3,4. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 120:36; 120:35.
Taxonomic affinity: It is possibly related to the extant species of *Lygodium.*

(3) Trilobosporites rotundus Shaw & Huang *sp. nov.* Pl. 29; figs. 1,2
圓形三瓣孢
Spores trilete; amb rounded triangular; 38-45 μ wide; ring-like valvae at the radial corners. Laesural arms simple type, ca. 14 μ long. surface view of exine faint finely granulate, 0.5 μ or less in width; lateral view of exine slightly verrucate; exine 1 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(1); Pl. 29; figs. 1,2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 122:4; 122:3.
Taxonomic affinity: It is possibly related to the extant species of *Lygodium.*

Genus 34. TRIPLANOSPORITES Pflug (in Thomson & Pflug 1952) *ex* Thomson & Pflug 1953
楊桃形三叉裂孢屬

1953 Palaeontographica, Bd. 94, Abt. B, p. 58
Type species: *Triplanosporites sinuosus* Pflug
Diagnosis: Spores with often indistinct Y mark, and extremely concave amb, with a polar axis that is longer than the equatorial axis.

Key to species

1. Surface view of exine granulate..... (5.) *T. tuberosus*
1. Surface view of exine smooth.
 2. Exine more than 1 μ thick..... (2.) *T. figuratus*
 2. Exine less than 1 μ thick.
  3. Lateral view of spores less than 21 μ long..... (4.) *T. minor*
  3. Lateral view of spores less than 21 μ long.
   4. Spores less than 30 μ wide..... (1.) *T. cretaceous*
   4. Spores more than 30 μ wide..... (3.) *T. formosus*

(1) Triplanosporites cretaceous Shaw & Huang *sp. nov.* Pl. 11; figs. 10-12
白堊紀楊桃形三叉裂孢
Spores trilete; amb extremely concave; 22- 24x22-24x25-26 μ wide. Laesural arms 8-9 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 0.5-1 μ thick.
Holotype: Slide YTN-1 3711.01-(1); Pl. 11; figs. 8,9. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Crtaceous.
Film: 85:42-19; 86:7A-29; 86:8A-30.
Taxonomic affinity: It may be related to the extant species of Cyatheaceae.

(2) Triplanosporites figuratus Shaw & Huang *sp. nov.* Pl. 12; fig. 4
輪廓楊桃形三叉裂孢
Spores trilete; amb extremely concave; 41- 43x41-43x43-45 μ wide. Laesural arms 20-22 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 1-1.5 μ thick.
Holotype: Slide YTN-1 3702.75-(1); Pl. 12; fig. 4. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3702.75m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 84:39-16.
Taxonomic affinity: It may be related to the extant species of Cyatheaceae.

(3) Triplanosporites formosus Shaw & Huang *sp. nov.* Pl. 12; figs. 1-3
美麗楊桃形三叉裂孢
Spores trilete; amb extremely concave; 32- 39x32-39x28-33 μ wide. Laesural arms 9-11 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 0.5-1 μ thick.
Holotype: Slide YTN-1 3710.70-3710.82-(1); Pl. 12; figs. 1-3. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3710.70-3710.82m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 41:11-13; 41:10-12; 41:18-20.
Taxonomic affinity: It may be related to the extant species of Cyatheaceae.

(4) Triplanosporites minor Shaw & Huang *sp. nov.* Pl. 36; figs. 10-12.
小楊桃形三叉裂孢

Spores trilete; amb extremely concave; 25-27x25-27x18-20 μ wide. Laesural arms 8-10 μ long. Surface view of exine smooth; lateral view of exine psilate; exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 36; figs.12; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:21-19; 93:18-16; 93:13-11.
Taxonomic affinity: It may be related to the extant species of Cyatheaceae.

(5) Triplanosporites tuberosus Shaw & Huang *sp. nov.* Pl.2, figs 3,4.
瘤紋楊桃形三叉裂孢
Spores trilete; 48-55 μ wide. Laesural arms indistinct. Surface view of exine granulate, about 1.5-3 μ wide. Lateral view of exine verrucate. Exine 1.5 μ thick.
Holotype: Slide YTN-1 3703.56-(3); Pl.2; figs. 3,4. CPC Micropaleontology Lab.
Stratigaphic occurrence: It is discovered from the core of the well YTN-1 3703.56m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 91:24-21; 91:25-22.
Taxonomic affinity: Unknown.

Genus 35. TUBEROSITRILETES Doring 1964
瘤紋三叉裂孢屬

Geologie, Jahrg. 13, H. 9, p. 1103
Type species: *Tuberositriletes montusous* Doring
Diagnosis: Azonotrilete microspores with triangular amb; angles well rounded; sides slightly concave to straight, rarely convex; proximal and distal surface granulate, tuberose or verrucate, Y mark distinct.

(1) Tuberositriletes formosensis Shaw & Huang *sp. nov.* Pl. 46; figs. 1-6
寶島瘤紋三叉裂孢
Spores trilete, 54-62 x 70-85u; polar view subtriangular to triquete; laesural arms 19-27 μ long, with flange-like margo; surface view of the exine with tuberculate process, the tuberculae 4-7 μ wide; lateral view of exine verrucate; exine 2-3 μ thick.
Holotype: Slide YKL-1 2312-2315-(3); Pl. 46; figs. 1-2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YKL-1 2312-2315m in offshore of north Taiwan; Lower Cretaceous.
Film: A7:3A-19; A7:4A-20; A7:30A-2; A7:29A-1; A7:40A-12; A7:41A-13.
Taxonomic affinity: Unknown.

Genus 36. VERRUCOSISPORITES Ibrahim 1933
半圓紋三叉裂孢屬

Dissertation, p. 24
Type species: *Verrucosisporites verrucosus* Ibrahim
Diagnosis: Spores trilete; sexine covered with warts or wrinkles (verrucate process).

(1) Verrucosisporites cretaceous Shaw & Huang *sp. nov.* Pl. 38; fig. 1
白堊紀半圓紋三叉裂孢
Spores trilete; rounded triangular; 32x41 μ . Laesural arms 20-23 μ long. Surface view of exine granulate, the granula 1x1 μ ; lateral view of exine verrucate processes; exine 1-1.5 μ thick.
Holotype: Slide YTN-1 3702.54-(1); Pl. 38; fig. 1. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3702.54m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 85:27-4.
Taxonomic affinity: It is possibly related to the extant species of *Lygodium*.

Genus 37. UNDULATISPORITES Pflug in Thomson & Pflug 1953
曲折唇形孢屬

Palaeontographica, Bd. 94, Abt. B. p. 52
Type species: *Undulatisporites microcutis* Pflug
Dignosis: Trilete miospores; amb rounded convexly triangular; Y mark slightly raised, finely sinuous; no torus; exine smooth or with subpsilate sculpture.

(1) Undulatisporites parvirotundus Shaw & Huang *sp. nov.* Pl. 14; figs. 1-3
小圓曲折唇形孢
Spores trilete; amb circular to rounded triangular; 14-20 μ wide. Laesural arms undulate, slightly raised, ca. 8-10 μ long. Surface view of exine with finely granulate, ca. 0.2 μ wide; lateral view of exine subpsilate to scabrate; exine thin, 0.5 μ thick or less.
Holotype: Slide YPT-1 3797.26-3797.28-(4); Pl. 14; figs.1-3; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 96:16-9; 96:17-10; 96:18-11.
Taxonomic affinity: Unknown.

(II) GYMNOSPERMAE

KEY TO GENERA

1. Grains saccate.
  2. Bladder equatorial circular.
    3. Bladder strongly reduced with sparsely spinulate processes..... 11. *Zonalapollenites*
    3. Bladder obvious without sparsely spinulate processes..... 2. *Callialasporites*
  2. Bladders prominently two saccate.
    4. Body usually less than 20 μ long or wide..... 10. *Vitreisporites*
    4. Body usually more than 20 μ long or wide..... 8. *Pityosporites*
1. Grains not saccate.
  5. Grains monosulcate, tricolpate, or poly-ridged.
    6. Grains with many longitudinal ridges..... 6. *Ephedripites*
    6. Grains monosulcate or tricolpate.
      7. Grains ellipsoidal monosulcate..... 5. *Cycadopites*
      7. Grains tricolpate..... 7. *Eucommidites*
  5. Grains circular, inaperturate, bilobate, girdle colpate or trilete.
    6. Grains single or tetrads, the distal view with a girdle colpate..... 4. *Classopollis*
    6. Grains inaperturate, bilobate.
      7. Lateral view of exine verrucate, papillate or scabrate.
        8. Lateral view of exine verrucate or papillate..... 3. *Camerosporites*
        8. Lateral view of exine scabrate..... 1. *Araucariacites*
      7. Lateral view of exine smooth..... 9. *Taxosodiaceaepollenites*

Genus 1. ARAUCARIACITES Cookson *ex* Couper 1953.
南洋杉粉屬

New Zealand Geol. Surv., Paleontol. Bull. 22, p. 39.
Type species: *Araucariacites australis* Cookson *ex* Couper.
Diagnosis: Spherical non-aperturate grains with granular exines of the type met with amongst recent members of the Araucariaceae.

Key to species

1. Grains less than 70 μ wide..... (1.) *A. australis*
1. Grains more than 70 μ wide..... (2.) *A. formosensis*

(1) Araucariacites australis Cookson *ex* Couper. Pl. 49; figs. 1-5
澳洲南洋杉粉
Grains inaperturate, 52-66 μ wide; amb circular to oval. Surface view of exine finely granulate; lateral view of exine scabrate; exine ca. 1 μ thick.
Slide: PK-3 2029.4-2031.24-(1); Pl. 49; figs. 1-5. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-3.2029.4-2031.24m in Peikang area of south Taiwan; Lower Cretaceous.
Film: A4:3A-30; A4:2A-29; A4:9A-36; A4:44A-27; A4: 41A-24; A4: 40A-23.
Taxonomic affinity: It may be related to the extant species Araucariaceae.

(2) Araucariacites formosensis Shaw & Huang *sp. nov.* Pl. 44; figs. 3-6
台灣南洋杉粉
Grains inaperturate, 72-86 μ wide; amb circular to oval. Surface view of exine finely granulate; lateral view of exine scabrate; exine 1-1.5 μ thick.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Holotype: Slide YTN-1 3722.1-3722.3-(4); Pl. 44; figs. 5,6. CPC Micropaleontology Lab.
Film: 118:33; 118:32; 120:18; 120:17.
Taxonomic affinity: It may be related to the extant species Araucariaceae.

Genus 2. CALLIALASPORITES Sukh Dev 1961
冠翼粉屬

Palaeobotanist, v.8, p.48
Type species: *Callialasporites trilobatus* (Balme) Dev
Diagnosis: Equator circular to oval; body circular, subcircular to triangular; grain complex, body encircled by an equatorial bladder, which may be incomplete to appear 3 separate bladders or a position in between; bladders small; Y- mark absent.

Key to species

1. Exine surface view of body with loosely striates..... (1.) *C. striatus*
1. Exine surface view of body obscure pattern..... (2.) *C. taiwanensis*

(1) Callialasporites striatus Shaw & Huang *sp. nov.* Pl. 21; fig. 6/ Pl.22; figs. 1,2
條紋冠翼粉
Grains 24.5x44 μ; amb rounded triangular. Body subtriangular to rounded triangular, 21x40 μ, encircled by an equatorial bladder; bladders 2 μ wide, with radiate-bands, the margin irregularly undulate. Surface view of body exine with loosely striates, 1 μ wide; body exine about 1-1.5 μ thick.
Holotype: Slide YPT-1-3797.26-3797.28-(3); Pl.22; figs. 1,2. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan; Lower Cretaceous.
Film: 95:31-27; 95:30-22; 95:32-24.
Taxonomic affinity: Unknown.

(2) Callialasporites taiwanensis Shaw & Huang *sp. nov.* Pl. 34; figs. 1-6.
台灣冠翼粉
Grains 27-34x39-43 μ; amb oval to ellipsoidal. Body circular to oval, 19-27x23-40 μ, encircled by an equatorial bladder; bladders 5-13 μ wide, with radiate-bands, the margin irregularly undulate. Surface view of body exine obscure pattern; body exine

thick, about 2-3.5 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(7); Pl. 34; figs. 5,6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 118:27; 118:26; 116:27; 116:26; 121:33; 121:34.
Taxonomic affinity: Unknown.

Genus 3. CAMEROSPORITES Leschik 1956
顆粒紋圓粉屬

Schweizerische Palaeontol. Abh. Bd. 72, p.40
Type species: *Camerosporites secatus* Leschik
Emended diagnosis by madler, 1964: Trilete miospores, amb circular, ornamented with broad, low, closely spaced verrucae or papillae, often irregularly shaped, showing on the margin as low convexities, which leave in between them a negative reticulum. Trilete mark usually indistinct. Exine weak and easily folded.

Key to species

1. Grains inaperturate, exine thin, 0.5 μ or less.
   2. Grains about 30-39 μ wide; exine less than 0.5 μ thick..... (1.) *C. formosus*
   2. Grains about 13-20 μ wide; exine 0.5 μ thick ..... (2.) *C. taiwanensis*
1. Grains inaperturate, exine ca. 1 μ thick..... (3.) *C. tuberosus*

(1) Camerosporites formosus Shaw & Huang *sp. nov.* Pl. 35; fig. 6
美形顆粒紋圓粉
Grains inaperturate, 30-39 μ wide; amb circular to oval. Surface view of exine granulate, 0.5-1 μ wide; lateral view of exine verrucate to papillate; exine thin, less than 0.5 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(1); Pl. 35; fig. 1. CPC Micropalevntology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 115:22-32.
Taxonomic affinity: It may be related to the gymnospermous (pteridospermous) pollen (Jansonius & Hill 1976).

(2) Camerosporites taiwanensis Shaw & Huang *sp. nov.* Pl. 17; figs. 3-6
台灣顆粒紋圓粉
Grains inaperturate, 13-20 μ wide; amb circular to oval. Surface view of exine granulate, 1-2 μ wide; lateral view of exine papillate to gemmate; exine 0.5 μ thick.
Holotype: Slide YPT-1 3797.26-3797.28-(2); Pl. 17; figs.3,4; CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 94:42A-34; 94:41A-33; 96:9-2; 96:10-3.
Taxonomic affinity: It may be related to the gymnospermous (pteridospermous) pollen (Jansonius & Hill 1976).

(3) Camerosporites tuberosus Shaw & Huang *sp. nov.* Pl. 35; figs. 1-5
瘤狀顆粒紋圓粉
Grains inaperturate, 26-43 μ wide; amb circular to oval. Surface view of exine irregular granulate, 1-2 μ wide; lateral view of exine papillate to gemmate; exine ca. 1 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(1); Pl. 35; figs. 3-5. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 116:1; 116:0; 115:14-24; 115:16-26.
Taxonomic affinity: It may be related to the gymnospermous (pteridospermous) pollen (Jansonius & Hill 1976).

Genus 4. CLASSOPOLLIS (Pflug)Pocock & Jansonius 1961
內環粉屬

Micropalaeonl., vol. 7 no. 4, p. 439-449
Type species: *Classopollis classoides* (Pflug)Pocock & Jansonius
Diagnosis: Pollen grains distally monoporate; ovoid, spherical; exine two-layered; frequently bearing a reduced trilete scar, at the proximal pole; exine always ornamented by striations in a band or girdle surrounding the equator and interrupted at only one point; the band usually, but not always, marking a zone of exinal thickening.

Key to species

1. Grains equatorial area without a striate band.
   2. Grains 24-31 μ wide..... (1.) *C. annulatus*
   2. Grains 16-23 μ wide..... (3.) *C. parvus*
1. Grains equatorial area with a striate band..... (2.) *C. classoides*

(1) Classopollis annulatus (Verb.) Li Pl. 52; figs. 1-5
環圈內環粉
Grains single or united in tetrads, spherical, circular in polar view, sometimes with a faint short-rayed tetrad mark at the proximal view; 24-31 μ wide. The distal view with a girdle colpate. Surface view of exine obscure pattern; lateral view of exine psilate; exine two-layered, ca. 2-3 μ thick.
Slide: PK-2 1689-(4); GH-1 1602-(1); HM-3 3845-3848-(1); PK-2 1620-(2); Pl. 52; figs. 1-5; CPC Micropaleontology Lab.

Stratigraphic occurrence: It is discovered from the core of the well PK-2 1620-1689m & GH-1 1602m in central part of western Taiwan, Lower Cretaceous.
Film: 106:16-26; 106:41-36; 106:2-37; 102:30-12; 8:28.
Taxonomic affinity: Palynomorphs of this genus are related to those of the organ genus *Cheirolepis*.

(2) Classopollis classoides (Pflug) Pocock & Jansonius Pl. 52; figs. 6-9
兗拉梭內環粉
Grains single or united in tetrads, spherical, circular in polar view, sometimes with a faint short-rayed tetrad mark at the proximal view; 21-28 μ wide. The equatorial area with striate bands, about 4-7 μ wide, composed of 5-8 striae. Surface view of exine obscure pattern; lateral view of exine psilate; exine two-layered, ca. 2-3 μ thick.
Slide: PK-2 1614-1615-(2); GH-1 1602-(1); Pl. 52; figs. 6-9; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-2 1614-15m & GH-1 1602m in central part of western Taiwan, Lower Cretaceous.
Film: 9:8-6; 106:43-38; 106:45-40; 106:44-39.
Taxonomic affinity: Palynomorphs of this genus are related to those of the organ genus *Cheirolepis*.

(3) Classopollis parvus (Brenner) Xu & Zhang Pl. 53; figs. 1-4
小內環粉
Grains single or united in tetrads, spherical, circular in polar view, sometimes with a faint short-rayed tetrad mark at the proximal view; 16-23 μ wide. The distal view with a girdle colpate.
Surface view of exine obscure pattern; lateral view of exine psilate; exine two-layered, ca. 2-3 μ thick.
Slide: PK-2 1689-(4); GH-1 1602-(1); Pl. 53; figs. 1-4; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-2 1689m & GH-1 1602m in central part of western Taiwan, Lower Cretaceous.
Film: 106:38-33; 106:39-34; 106:17-27; 106:16-17.
Taxonomic affinity: Palynomorphs of this genus are related to those of the organ genus *Cheirolepis.*

Genus 5. CYCADOPITES Wodehouse 1933
蘇鐵狀粉屬

Bull. Torrey Botanical Club, v. 60, p. 483
Type species: *Cycadopites follicularis* Wilson & Webster 1964
Diagnosis(Krutzsch 1970): Grains ellipsoidal, small to medium size mostly about twice as long as wide, more or less symmetrical, with monosulcate furrow extending full length, mostly opened wider at the ends than in the middle, usually with folding lips along the sulcus. exine smooth.

Key to species

1. Surface view of exine smooth; lateral view of exine psilate.
  2. Grains 23-29 μ long.
    3. The angle of the furrow acute..... (1.) *C. lanceolatus*
    3. The angle of the furrow obtuse..... (4.) *C. yunlinensis*
  2. Grains less than 20 μ long..... (3.) *C. ovalis*
1. Surface view of exine obscure pattern; lateral view of exine scabrate.....
  ..... (2.) *C. lanceolatus* var. *scabratus*

(1) Cycadopites lanceolatus Shaw & Huang *sp. nov.* Pl. 40; figs. 4-9
披針形蘇鐵狀粉
Grains 23-29 μ long, 11-15 μ wide; furrow extending full length, the angle of the furrow acute. Surface view of exine smooth; lateral view of exine psilate; exine 0.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(5); Pl. 40; figs.4,5; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:40-38; 93:41-39; 93:32-30; 94:31-29; 94:9-4; 94:8-3
Taxonomic affinity: It may be related to the extant species of either *Cycas* or *Ginkgo*.

(2) Cycadopites lanceolatus var. **scabratus** Shaw & Huang *var. nov.* Pl. 38; fig. 8/ Pl. 40; figs. 10-12
粗糙披針形蘇鐵狀粉
Grains 23-27 μ long, 13-15 μ wide; furrow extending full length, the angle of the furrow acute. Surface view of exine obscure pattern; lateral view of exine scabrate; exine 0.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(5); Pl. 40; figs.10,11; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 92:37-35; 92:36-34; 87:31A-9.
Taxonomic affinity: It may be related to the extant species of either *Cycas* or *Ginkgo*.

(3) Cycadopites ovalis Shaw & Huang *sp. nov.* Pl. 40; figs. 1-3
廣卵蘇鐵狀粉
Grains 18 μ long, 13 μ wide; furrow widely open and extending full length. Surface view of exine smooth; lateral view of exine psilate; exine 0.5 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(5); Pl. 40; figs.1-3; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:42-40; 94:10A-2; 94:9A-1.
Taxonomic affinity: It may be related to the extant species of either *Cycas* or *Ginkgo*.

(4) Cycadopites yunlinensis Shaw & Huang *sp. nov.* Pl. 51; figs. 8-9
雲林蘇鐵狀粉
Grains 29-35 μ long, 14-18 μ wide; furrow extending full length, the angle of the furrow obtuse. Surface view of exine smooth; lateral view of exine psilate; exine 0.5 μ thick.
Holotype: Slide PK-3 2032.90-2034.40-(1); Pl. 51; figs.8,9; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-3.2032.9-2034.4m in Peikang area of south Taiwan; Lower Cretaceous.
Film: A5:23A-11; A5:22A-10.
Taxonomic affinity: It may be related to the extant species of either *Cycas* or *Ginkgo.*

Genus 6. EPHEDRIPITES Bolkhoviyina 1953 *ex* Potonie 1958
麻黃粉屬

Synopsis ll, p. 88
Type species: *Ephedripites mediolobatus* Bolkhoviyina 1953 *ex* Potonie 1958
Diagnosis: Grains ellipsoidal to fusiform, with 3-12 longitudinal ridges.

Key to species

1. Grains spheroidal to subprolate;
  3. The elevated muri in seven series.
    4. Amb spheroidal to prolate-spheroidal..... (1.) *E. chinensis*
    4. Amb prolate to perprolate..... (3.) *E. mundulus*
  3. The elevated muri in six series..... (2.) *E. formosensis*
1. Grains prolate to prolate.
  2. The elevated muri in four series..... (4.) *E. speciosus*
  2. The elevated muri in six series..... (5.) *E. yunlinensis*

(1) Ephedripites chinensis Shaw & Huang *sp. nov.* Pl. 51; figs. 1-3.
中國麻黃粉
Grains encircled type; spheroidal to prolate-spheroidal; 22x27 μ ; surface view striate,the elevated muri in seven series, about 1.5-2 μ thick, the striae in line shape, about 0.3-0.5 μ wide.
Holotype: Slide YKL-1 2312-2315m-(1); Pl. 51; figs. 1-3. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YKL-12312-2315m in offshore of northern Chilung; Lower Cretaceous.
Film: A7:31A-3; A7:32A-4; A7:33A-5.
Taxonomic affinity: Palynomorphs of this genus are related to those of the extant *Ephedra.*

(2) Ephedripites formosensis Shaw & Huang *sp. nov.* Pl. 50; figs. 1-4.
寶島麻黃粉

Grains encircled type; prolate-spheroidal to subprolate; 19-24x31-33 μ ; surface view striate, the elevated muri in six series, about 2 μ thick, the striae in line shape, about 0.3-0.5 μ wide.
Holotype: Slide YKL-1 2312-2315m-(1); Pl. 50; figs. 1-2. CPC Micropalevntology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YKL-12312-2315m in offshore of northern Chilung; Lower Cretaceous.
Film: A7:36A-8; A7:37A-9; A7:14A-30; A7:13A-29.
Taxonomic affinity: Palynomorphs of this genus are related to those of the extant *Ephedra.*

(3) Ephedripites mundulus Shaw & Huang *sp. nov.* Pl. 50; figs. 9-12.
整齊麻黃粉
Grains encircled type; prolate to perprolate; 12-13x21-27 μ ; surface view striate, the elevated muri in seven series, about 1 μ thick or less, the striae in line shape, about 0.2-0.3 μ wide.
Holotype: Slide YPT-1 3745m-(1); Pl. 50; figs. 11,12 CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-13745m in offshore of western Tainang; Lower Cretaceous.
Film: A3:7A-13; A3:8A-14; A3:2A-8; A3:3A-9.
Taxonomic affinity: Palynomorphs of this genus are related to those of the extant *Ephedra.*

(4) Ephedripites speciosus Shaw & Huang *sp. nov.* Pl.50; figs. 5-8.
美形麻黃粉
Grains encircled type; prolate to perprolate; 10-15x21-24 μ ; surface view striate, the elevated muri in four series, about 2-3 μ thick, the striae in line shape,about 0.3-0.5 μ wide.
Holotype: Slide YKL-1 2155-2160m-(2); Pl. 50; figs. 5,6. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YKL-1 2155-2160m in offshore of northern Chilung; Lower Cretaceous.
Film: A7:9A-25; A7:10A-26; A3:39A-1; A3:40A-2.
Taxonomic affinity: Palynomorphs of this genus are related to those of the extant *Ephedra.*

(5) Ephedripites yunlinensis Shaw & Huang *sp. nov.* Pl. 51; figs. 6-7.
雲林麻黃粉
Grains encircled type; perprolate; 17x32 μ ; the corner of a spore process angular thickening; surface view striate, the elevated muri in five series, about 2 μ thick, the striae in line shape, about 0.2-0.3 μ wide.
Holotype: Slide PK-3 2047-2050m-(1); Pl. 51; figs. 6-7. CPC Micropalevntology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-3 2047-

2050m in Peikang area of southern Taiwan; Lower Cretaceous.
Film: A5:28A-16; A5:29A-17.
Taxonomic affinity: Palynomorphs of this genus are related to those of the extant *Ephedra*.

Genus 7. EUCOMMIIDITES Erdtman 1948 *ex* Potonie 1958
不齊溝粉屬

1948 Geol. Foren. Stockholm Forh., Bd, 70, H,2, no. 453,p. 267
Type species: *Eucommiidites troedssonii* (Erdtman) Potonie 1958
Diagnosis: Spores (pollen grains) asymmetrical tricolpate, of medium size, usually prolate, the three colpate features are rather different in length than equal. The central aperture often being somewhat broadened at the ends and rarely ending with a taper. Exine smooth or infrapunctate.

(1) Eucommiidites formosus Shaw & Huang *sp. nov.* P1.42, figs. 1-3
美形不齊溝粉
Grains 3-colpate; prolate spheroidal 20.5 X 25.5 μ ; colpi about 19-21 μ long; 3-furrowes in one face, one straight, the others curving. Exine 0.5 μ thick , lateral view psilate to subpsilate; surface view smooth to obscure pattern.
Holotype: Slide YPT-1 3794.07m-(3); Plate 42; figs. 1-3. CPC Micropaleontology Lab.
Stratigraphy occurrence: It is discovered from the core of the well YPT-1 3794.07m in YTN structure of offshore south Taiwan. Lower Cretaceous.
Film: 98:42A-36; 98:43A-37; 98:44A-35.
Taxonomy affinity: Unknown.

Genus 8. PITYOSPORITES Seward 1914
松粉屬

British Mus. (Nat. Hist.), Brit. Antarctic (Terra Nova) Exp., 1910; Nat. Hist. Rept., Geol., v. i, no. l, p. 23
Type species: *Pityosporites antarcticus* Seward
Emended diagnosis(by Manum 1960): Grains with two bladders. Bladders attached to the ventral side of the body and distinctly set off from it, greatly diverging, and narrowing towards their roots; dorsally the roots reach the equator of the body or slightly beyond it, ventrally they are separated by a more or less narrow furrow. Bladders reticulate. Body wall smooth or only finely sculptured, its thickness moderate and not conspicuously increasing towards the roots of the bladders.

Key to species

1. Corpus longitudinally oblong..... (1.) *P. longicorpus*

1. Corpus oblate-spheroidal..... (2.) *P. vulgaris*

(1) Pityosporites longicorpus Shaw & Huang *sp. nov.* Pl. 38; fig. 6/Pl. 43; fig. 10
長本体松粉
Grains bisaccate, total length 57 μ ; corpus longitudinally oblong, 21x35 μ ; bladders 32x21 μ , finely reticulate; bladders root equal or less than corpus depth.
Holotype: Slide YTN-1 3711.01-(6); Pl. 43; fig. 10. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 86:6A-29; 86:7A-30.
Taxonxomic affinity: It is possibly related to the extant species of Pinaceae.

(2) Pityosporites vulgaris Shaw & Huang *sp. nov.* Pl. 43; fig.11
常見松粉
Grains bisaccate , total length 71 μ ; corpus oblate-spheroidal,44x32 μ ; bladders 31-34x28-34 μ , finely reticulate; bladders root equal or less than corpus depth.
Holotype: Slide YTN-1 3702.75-(5); Pl. 43; fig. 11. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3702.75m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 84:41-18.
Taxonomic affinity: It is possibly related to the extant species of Pinaceae.

Genus 9. TAXODIACEAEPOLLENITES Kremp 1949 *ex* Potonie 1958
杉科粉屬

1958 Beih. Geol. Jahrb., H.31, p.78
Type species: *Taxodiaceaepollenites hiatus* (Kremp) Potonie 1958
Diagnosis: Grains inaperturate but bilobately open; subspheroidal.

(1) Taxodiaceaepollenites taiwanensis Huang 1979. Pl. 48; figs. 9-12
台灣杉科粉
Taiwania **24:** 84.
Grains inaperturate but bilobately open; subspheroidal; 26-43 μ wide; exine psilate, 0.5-1 μ thick; sexine smooth.
Slide: YKL-1 1305-1310m-(1); Pl. 48; figs. 9-10. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YKL-11305-1310m in offshore of northern Chilung; Lower Cretaceous.
Film: A6:24A-15; A6:25A-16; A8:39A-13; A8:40A-14.
Taxonomic affinity: Palynomorphs of this genus are related to those of the extant *Metasequoia* (Canright, 1974).

Genus 10. VITREISPORITES Leschik 1956
小雙氣囊粉

Schweizer. Palaont. Abh., Bd. 72, p. 53
Type species: *Vitreisporites signatus* Leschik
Dignosis: Grains bisaccate; corpus sub circular. Present of a thickening at attachment zones of the bladders. At proximal pole a weak Y-mark can be seen. Size of corpus less than 20 μ.

Key to species

1. Grains less than 25 μ wide..... (1.) *V. mediocris*
1. Grains more than 27 μ wide..... (2.) *V. pallidas*

(1) Vitreisporites mediocris Shaw & Huang *sp. nov.* Pl. 43; figs. 1,2
中大形小雙氣囊粉
Grains bisaccate, total length 29 μ, corpus 6-8x20x? μ; bladders 19-20x10-11x? μ, finely reticulate; bladders root equal or less than corpus depth. Presence of a thickening at attachment zones of the bladders.
Holotype: Slide YPT-1 3794.07-3794.09-(4); Pl. 43; figs.1,2; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:36-34; 93:37-35.
Taxonomic affinity: Palynomorphs of this genus are related to those of the organ genus *Caytonanthus.*

(2) Vitreisporites pallidas (Reissienger) Nilsson Pl. 43; figs. 3-9
淡色小雙氣囊粉
Grains bisaccate,total length 19-27 μ, corpus 10-12x14-16x? μ; bladders 15-17x8-9x? μ, finely reticulate; bladders root equal or less than corpus depth. Presence of a thickening at attachment zones of the bladders.
Slide: YPT-1 3794.07-3794.09-(3); Pl. 43; figs. 3-7; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YTN structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:3-1; 93:4-2; 93:5-3; 98:37A-31; 98: 38A-32; 92:6-4;92:7-5.
Taxonomic affinity: Palynomorphs of this genus are related to those of the organ genus *Caytonanthus.*

Genus 11. ZONALAPOLLENITES Pflug in Thomoson & Pflug 1953
環翼鐵杉粉屬

Palaontographica, Abt. B, Bd. 94, p.66
Type species: *Zonalapollenites igniculus* (Potonie) Pocock
Dignosis: Grains inaperturate; exine of polar regions with a strongly vestigal circular bladder. Total length 45-85 μ.

(1) Zonalapollenites peikangensis Shaw & Huang *sp. nov.* Pl. 51; figs. 10-12.
北港環翼鐵杉粉
Grains inaperturate, 37-46 μ wide; amb circular to oval. Surface view of exine granulate; lateral view of exine gemmate with sparsely spinulate processes; bladder strongly reduced.
Holotype: Slide PK-3 2057.0-2058.05m-(1); Pl. 51; figs. 10-12. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-3.2057.0-2058.05m in Peikang area of south Taiwan; Lower Cretaceous.
Film: A7:19A-35; A7:20A-36; A7:21A-37.
Taxonomic affinity: Palynomorphs of this genus are related to those of the extant *Tsuga.*

(III) ANGIOSPERMAE

KEY TO GENERA

1. Grains 1-colpate..... 1. *Confertisulcites*
1. Grains 3-colpate..... 2. *Tricolpopollenites*

Genus 1. CONFERTISULCITES Anderson 1960
木蘭粉屬

New Mexico, Inst. Min. Technol., Mem. 6, p. 27
Type species: *Confertisulcites knowltoni* Anderson
Diagnosis: Elongate, bilateral, monosulcate pollen with a closed furrow in contact throughout length or broadly overlapping or easily capable of overlapping; furrow extending to the ends of the grain; sculpture usually psilate to faintly scabrate or flecked.
Remarks: *Magnolipollis* is a jounior synonym.

Key to species

1. Grains more than 50 μ in length; exine 0.5 μ thick..... (1.) *C. cretaceous*
1. Grains less than 50 μ in length; exine 1 μ thick..... (2.) *C. formosus*

(1) Confertisulcites cretaceous Shaw & Huang *sp. nov.* Pl. 39; figs. 1,2
白堊紀木蘭粉
Grains monosulcate, about 63 μ long, 29 μ wide; polar view spindle shape. Colpi as long as axis. Surface view of exine smooth; lateral view of exine psilate; exine thin, 0.5 μ thick.
Holotype: Slide YTN-1 3722.1-3722.3-(2); Pl. 39; figs. 1,2. CPC Micropaleontology

Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3722.1-3722.3m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 117:5; 117:6.
Taxonomic affinity: It may be related to the extant species of Magnoliaceae.

(2) Confertisulcites formosus Shaw & Huang *sp. nov.* Pl. 41; figs. 1-3
美型木蘭粉
Grains monosulcate, about 40 μ long ,13 μ wide; polar view spindle shape. Colpi as long as the long axis. Surface view of exine smooth; lateral view of exine psilate; exine 1 μ thick.
Holotype: Slide YPT-1 3797.26-3797.28-(1); Pl. 41; figs.1-3; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3797.26-3797.28m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 94:31A-23; 94:29-21; 94:30-22.
Taxonomic affinity: It may be related to the extant species of Magnoliaceae.

Genus 2. TRICOLPOPOLLENITES Pflug & Thomson in Thomson & Pflug 1953
三溝粉屬

Palaeontographica Bd. 94, Abt. B, p. 95
Type species: *Tricolpopollenites parmularius* (Potonie) Thomson & Pflug
Diagnosis: Pollen with polar axis as long as or longer than equatorial axis; three colpi in symmetrical distribution; colpi meridional.

Key to species

1. Surface view of exine smooth; lateral view of exine psilate.
   2. Grains exine 2 μ thick..... (2.) *T. lepidus*
   2. Grains exine less than 2 μ thick.
      3. Amb perprolate..... (8.) *T. perprolatus*
      3. Amb prolate-spheroidal to prolate.
         4. Amb prolate-spheroidal to subprolate..... (1.) *T. houpiensis*
         4. Amb prolate.
            5. Spores length more than 25 μ ..... (7.) *T. peikangensis*
            5. Spores length less than 25 μ ..... (5.) *T. oblongs*
1. Surface view of exine obscure pattern, lateral view of exine subpsilate or scabrate.
   5. Spores length more than 30 μ ..... (6.) *T. orientalis*
   5. Spores length less than 30 μ .
      6. Grains three colpi in one face..... (3.) *T. medieus*
      6. Grains three colpi not in one face..... (4.) *T. mundulus*

(1) Tricolpopollenites houpiensis Shaw & Huang *sp. nov.* Pl. 45; figs. 1,2.
後壁三溝粉

Grains 3-colpate, 25x35 μ ; prolate-spheroidal to subprolate; Colpi 26 μ long. Surface view of exine smooth, lateral view of exine psilate, exine 1 μ thick.
Holotype: Slide HP-1 4077.3-4077.9-(2); Pl. 45; figs.1,2; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well HP-1 4077.3-4077.9m in Peikang area of south Taiwan; Lower Cretaceous.
Film: C6:1; C6:2.
Taxonomic affinity: Unknown.

(2) Tricolpopollenites lepidus Shaw & Huang *sp. nov.* Pl. 42; figs. 4,5
美麗三溝粉
Grains 3-colpate; subprolate to prolate; 25x39 μ . Colpi 27 μ long. Surface view of exine smooth, lateral view of exine psilate, exine 2 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 42; figs. 4,5; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 98:45A-39; 99:8-1.
Taxonomic affinity: Unknown.

(3) Tricolpopollenites medieus Shaw & Huang *sp. nov.* Pl. 41; figs. 11,12
中形三溝粉
Grains 3-colpate, 17-19x25-27 μ ; prolate. Colpi 19-23 μ long, three colpi in one face. Surface view of exine obscure pattern; lateral view of exine psilate to subpsilate; exine 0.5-1 μ thick.
Holotype: Slide YTN-1 3703.56-(4); Pl. 41; fig. 10,11; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3703.56m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 91:26-23; 91:27-24
Taxonomic affinity: Unknown.

(4) Tricolpopollenites mundulus Shaw & Huang *sp. nov.* Pl. 38; fig. 7 / Pl. 41; fig. 12
整潔三溝粉
Grains 3-colpate, 13.5x25 μ ; prolate. colpi 22 μ long, three colpi not in one face. Surface view of exine obscure pattern; lateral view of exine scabrate; exine 0.5 μ thick.
Holotype: Slide YTN-1 3711.01-(7); Pl. 41; fig. 12. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YTN-1 3711.01m in YTN structure of offshore south Taiwan; Lower Cretaceous.
Film: 87:29A-6; 87:30A-7.
Taxonomic affinity: Unknown.

(5) Tricolpopollenites oblongs Shaw & Huang *sp. nov.* Pl. 41; figs. 6-9
長形三溝粉

Grains 3-colpate, 11-12.5x20-22 μ ; prolate. Colpi 14-16 μ long. Surface view of exine smooth, lateral view of exine psilate, exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(3); Pl. 41; figs. 6,7; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: 93:19-17; 93:20-18; 95:35-27; 94:17-9.
Taxonomic affinity: Unknown.

(6) Tricolpopollenites orientalis Shaw & Huang *sp. nov.* Pl. 48; figs. 7,8
東方三溝粉
Grains 3-colpate, 15-17x30-34 μ ; prolate. Colpi 20-23 μ long. Surface view of rough pattern, lateral view of exine scabrate, exine 0.5-1 μ thick.
Holotype: Slide YKL-1 1305-1310-(1); Pl. 48; figs. 7-8. CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YKL-1 1305-1310m in offshore of northern Chilung; Lower Cretaceous.
Film: A6:28A-19; A6:29A-20;
Taxonomic affinity: Unknown.

(7) Tricolpopollenites peikangensis Shaw & Huang *sp. nov.* Pl. 48; figs. 5,6.
北港三溝粉
Grains 3-colpate, 16-18x27-31 μ ; prolate. Colpi 25-27 μ long. Surface view of exine smooth, lateral view of exine psilate, exine 0.5-1 μ thick.
Holotype: Slide PK-3 2029.40-2031.24-(1); Pl. 48; figs.5,6; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well PK-3 2029.4-2031.24m in Peikang area of south Taiwan; Lower Cretaceous.
Film: A4:42A-25; A4:43A-26.
Taxonomic affinity: Unknown.

(8) Tricolpopollenites perprolatus Shaw & Huang *sp. nov.* Pl. 48; figs. 1-4
長縱三溝粉
Grains 3-colpate, 10-18x25-32 μ ; perprolate. Colpi 23-32 μ long. Surface view of exine smooth, lateral view of exine psilate, exine 0.5-1 μ thick.
Holotype: Slide YPT-1 3794.07-3794.09-(1); Pl. 48; figs. 1,2; CPC Micropaleontology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1 3794.07-3794.09m in YPT structure of offshore south Taiwan, Lower Cretaceous.
Film: A1:27A-12; A1:26A-11; A1:22A-7; A1:23A-8.
Taxonomic affinity: Unknown.

(IV) ALGAE

Genus 1. CONCENTRICYSTES Rossignol 1962
指紋形囊孢屬

Pollen et Spores, v. 4, p.134
Type species: *Concentricystes rubinus* Rossignol
Diagnosis: Grains shape circular, with raised concentric striation; the cysts often split in two halves along the equator.

(1). Concentricystes cretaceous Shaw & Huang *sp. nov.* Pl. 54; figs. 1-9.
白堊紀指紋形囊孢
Cysts shape circular to subcircular, 23-33 μ wide; surface view of exine striate, the ribs about 0.3-0.5 μ wide, the grooves 0.2 μ wide; archeopyle circular.
Holotype: Slide YPT-1 3679.5m-(1); Pl. 54; figs. 1-3. CPC Micropalevntology Lab.
Stratigraphic occurrence: It is discovered from the core of the well YPT-1.3679.5m in offshore of western Tainang; Lower Cretaceous.
Film: A3:41A-3; A3:42A-4; A3:43A-5; A3:19A-25. A3:20A-26; A3:21A-27; A3: 22A-28; A2:25A-24; A2:26A-25.
Note: This form is probably of fluvial origin, and resembles many hystricospheres (Jansonius & Hills, 1976:553).

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台灣白堊紀之化石孢粉(2)-分類處理

蕭承龍、黃增泉

摘　　要

本文於台灣陸海域十七口地下探井， 白堊紀早期地層中，共發現孢粉化石五十四形態屬一百二十形態種， 其中蕨類孢子計有四十五形態屬九十五形態種，裸子植物花粉計有七形態屬十九形態種；被子植物花粉計有二形態屬六形態種; 藻類孢子計有一形態屬一形態種。 由早期白堊紀之孢粉化石群聚， 顯示裸子植物花粉爲其中顯著的一個組成分子； 蕨類孢子種類趨異性極大亦爲其中顯著的植物群；而被子植物花粉僅有單溝及三溝的原始型花粉。

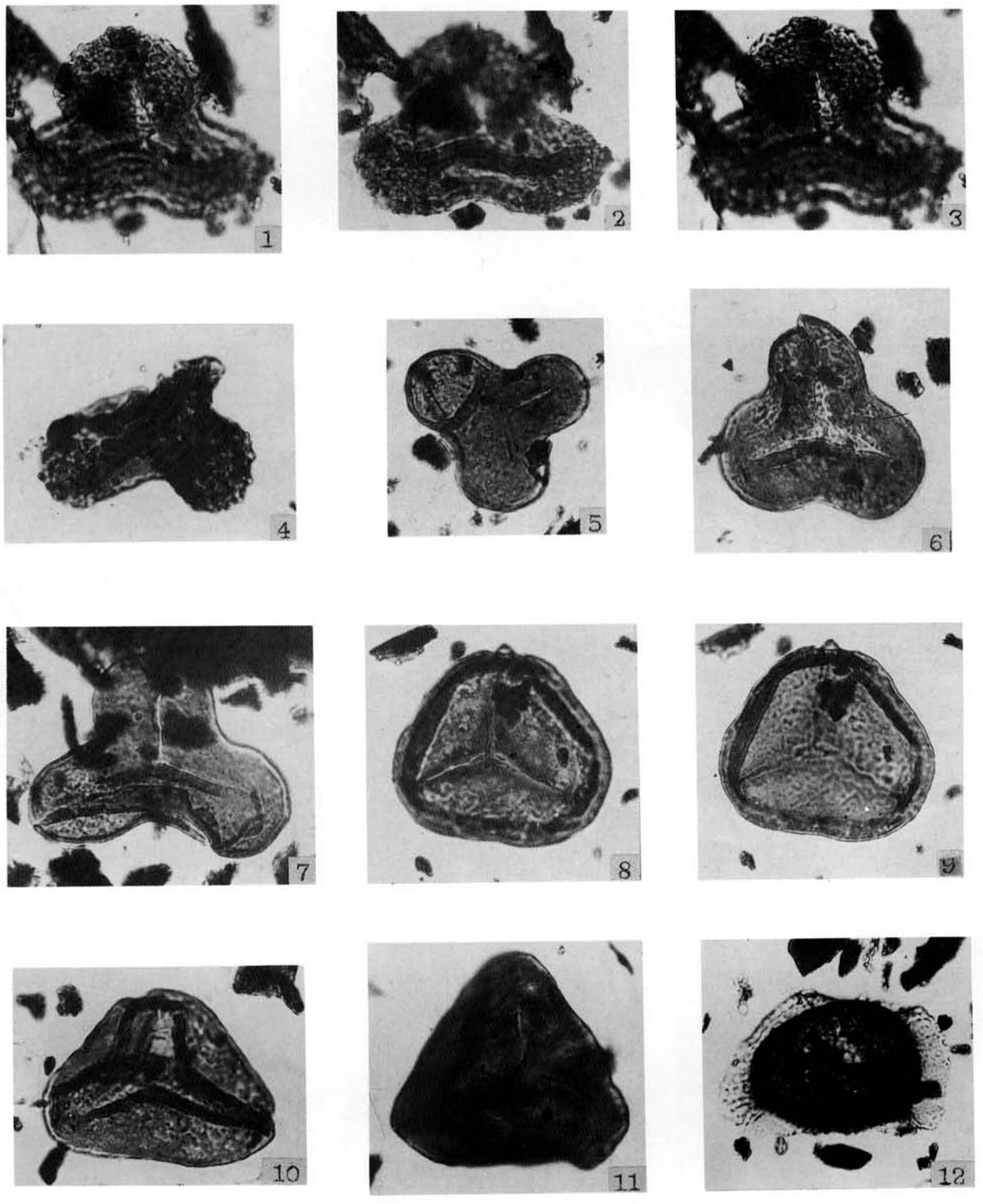


PLATE 1. Figs. 1-4. *Impardecispora apiverrucata* var. *taiwaniana* (Fig. 1. YTN-1 3711.01m-(2), 86:23A-1; Fig. 2. YTN-1 3711.01m -(2), 86:24A-2; Fig. 3. YTN-1 3711.01m-(2), 86:25A-3; Fig. 4. YTN-1 3711.01m-(5), 86:4A-19); Figs. 5-7. *Cyatheidites taiwanensis* Fig. 5. (YTN-1 3711.01m- (7), 86:9A- 31; Fig. 6. YTN-1 3711.01m-(3), 86:27A-5; Fig. 7. YTN-1 3711.01m-(4), 86:32A-10); Figs. 8-10. *Biretisporites vulgaris* Fig. 8. (YTN-1 3711.01m-(5), 86:44A-22; Fig. 9. YTN-1 3711.01m(5), 86:1A-23; Fig. 9. YTN-1 3711.01m-(6), 86:5A-27); Figs. 11. *Deltoidospora communis* (YTN-1 3702.75m-(2), 84:26-3); Figs. 12. *Aequitriradites spinulosus* var. *taiwanensis* (YTN-1 3711.01m-(1), 85:24) (Figs. 1-12. x 600)

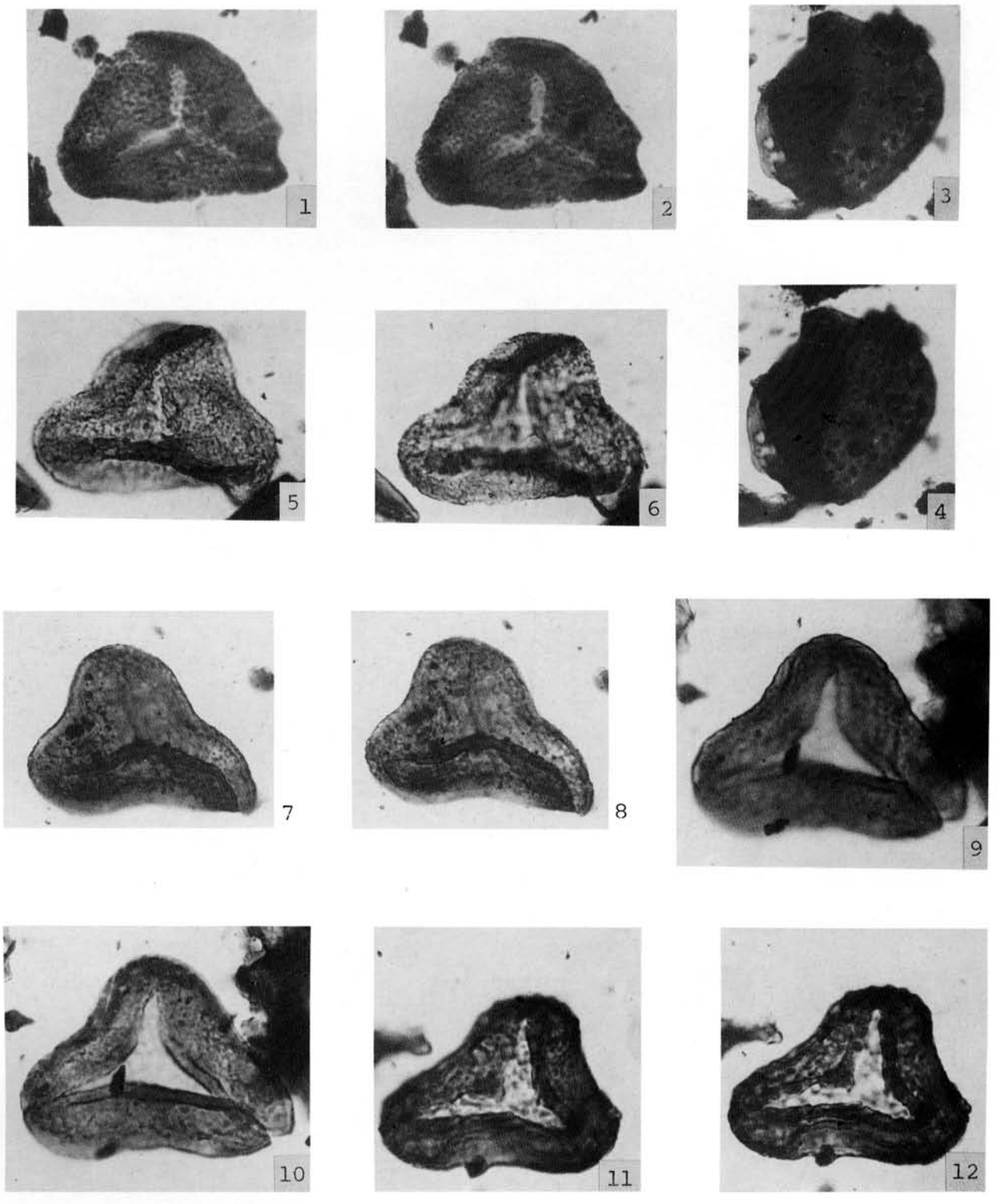


PLATE 2. Figs. 1,2. *Corrugatisporites formatus* (Fig. 1. YPT-1 3794.07m- (3), 93:25-22; Fig. 2. YPT-1 3794.07m(3), 93:24-21); Figs. 3,4. *Triplanosporites tuberosus* Fig. 3. (YTN-1 3703.56m- (3), 91:24-21; Fig. 4. YTN-1 3703.56m(3), 91:25-22); Figs. 5-8. *Concavissimisporites taiwanensis* Fig. 5. (YTN-1 3722.1 -3722.3m-(3), 117:35; Fig. 6. YTN-1 3722.1-3722.3m- (3),117:34; Fig. 7. YTN-1 3722.1-3722.3m-(3), 117:32; Fig. 8. YTN-1 3722.1-3722.3m-(3), 117:31); Figs. 9,10. *Concavissimisporites speciosus* Fig. 9. (YTN-1 3722.1- 3722.3m-(4), 118:31; Fig. 10. YTN-1 3722.1-3722.3m- (4), 118:30); Figs. 11,12. *Impardecispora determinatus* Fig. 11. (YTN-1 3722.1- 3722.3m-(4), 118:34; Fig. 12. YTN-1 3722.1-3722.3m-(4), 118:35) (Figs. 1-12 x 600)

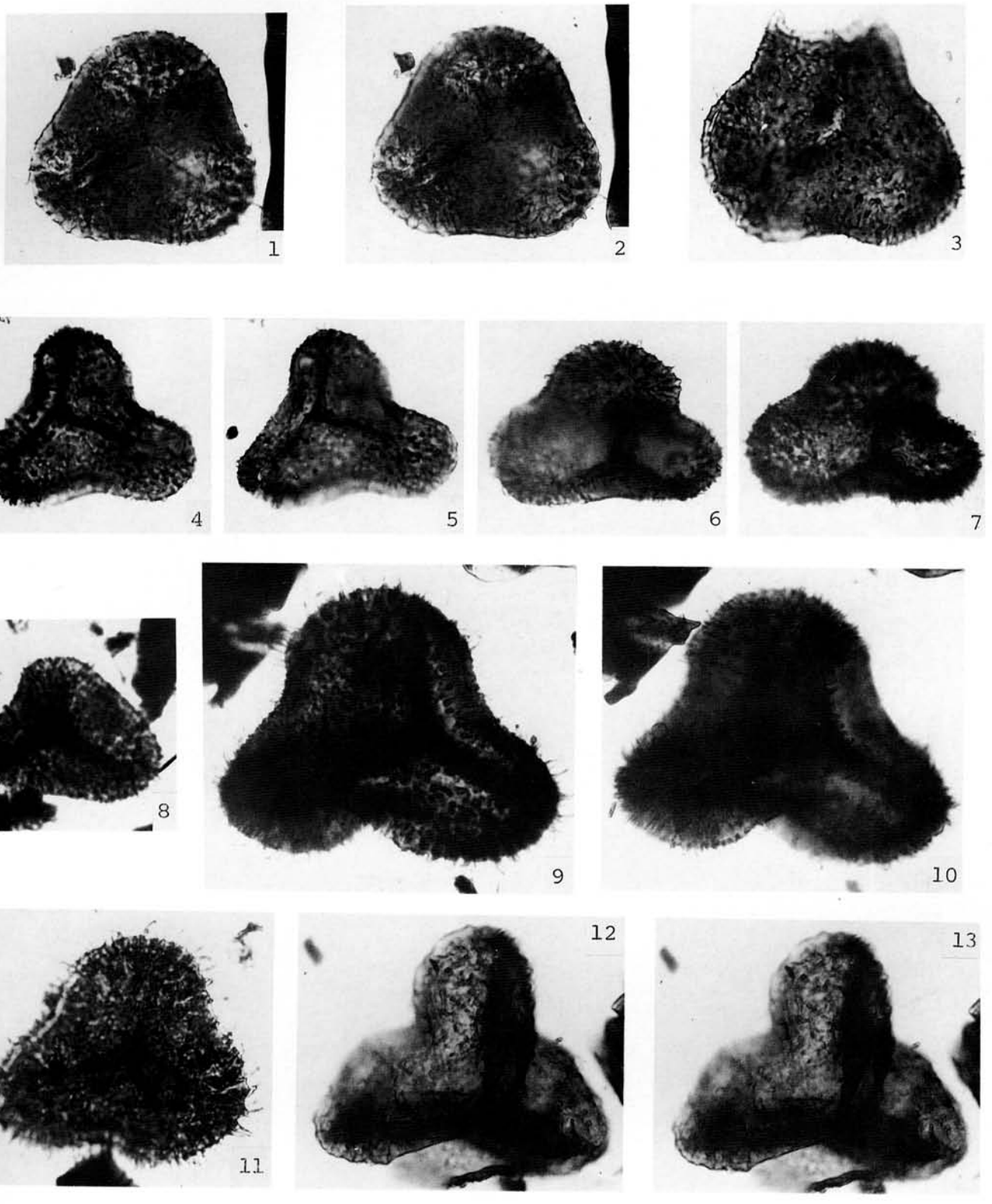
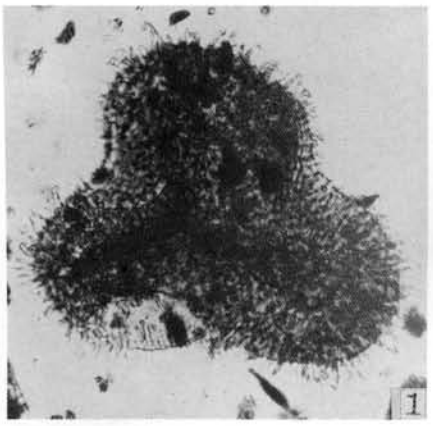
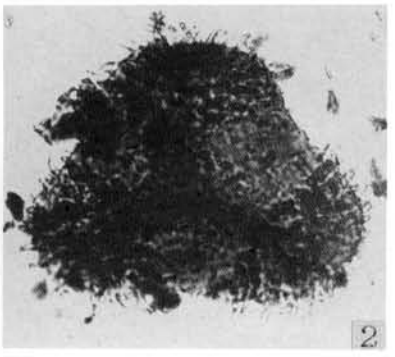
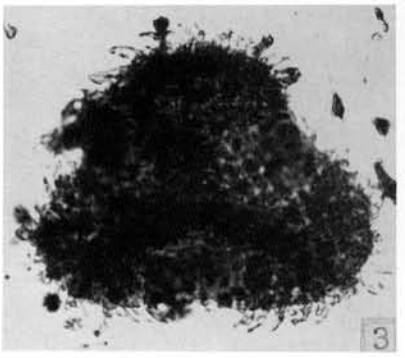
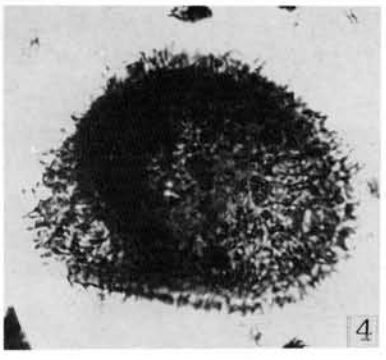


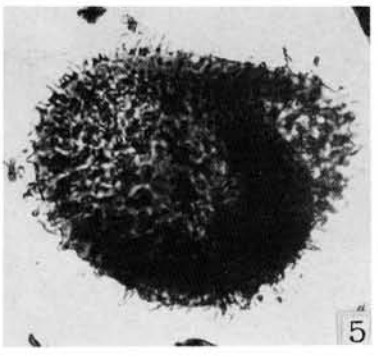
PLATE 3. Figs. 1-3. *Pilosisporites taiwanensis* (Fig. 1. YTN-1 3722.1- 3722.3m-(1), 116:10; Fig. 2. YTN-1 3722.1-3722.3m- (1), 116:8; Fig. 3. YTN-1 3722.1-3722.3m-(5), 120-19); Figs. 4-8. *P. parvus* (Fig. 4. YTN-1 3722.1-3722.3m-(5), 120:12; Fig. 5. YTN-1 3722.1-3722.3m-(5), 120-11; Fig. 6. YTN-1 3722.1 -3722.3m-(5), 120-10; Fig. 7. YTN-1 3711.01m-(7), 87:24A-2); Figs. 9-11. *Pilosisporites verus* var. *formosensis* (Fig. 9. YTN-1 3722.1-3722.3m-(4), 118:9; Fig. 10. YTN-1 3722.1-3722.3m -(4), 118:8; Fig. 11. YTN-1 3711.01m-(9), 87:8A-30); Figs. 12-13. *P. paucipilosus* (Fig. 12. YTN-1 3722.1-3722.3m-(1), 116:11; Fig. 13. YTN-1 3722.1-3722.3m-(1), 116:12) (Figs. 1-13. x 600)

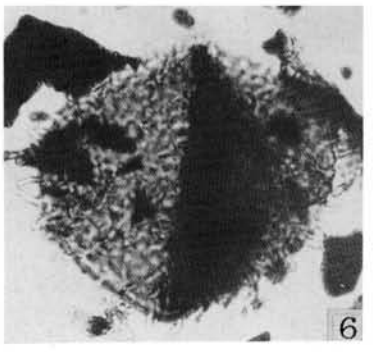


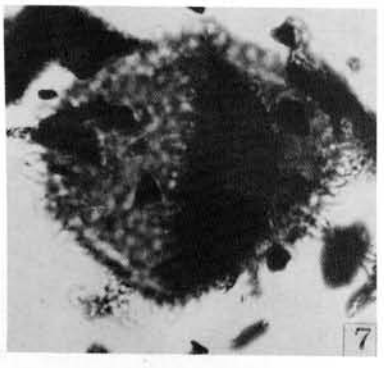


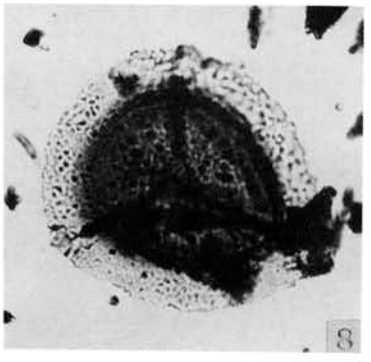












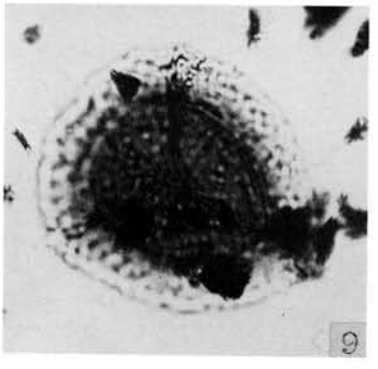


PLATE 4. Figs. 1-3. *Pilosisporites verus* var. *formosensis* (Fig. 1. YTN-1 3711.01m-(4), 86:30A-8; Fig. 2.YTN-1 3711.01m-(1), 85:13-34; Fig. 3. YTN-1 3711.01m-(1), 85:12-33); Figs. 4-7. *P. triplanatus* (Fig. 4. YTN-1 3711.01m-(1), 85:8-29;Fig. 5. YTN-1 3711.01m-(1), 85:9-30; Fig. 6. YTN-1 3711.01m -(7), 86:15A-37; Fig. 7. CFC-5 3711.01m-(7), 86:16A-38); Figs. 8,9. *Aequitriradites spinulosus* var. *taiwanensis* (Fig. 8. YTN-1 3711.01m-(1), 85:10-31; Fig. 9. YTN-1 3711.01m -(1), 85:11-32) (Figs. 1-9. x 600)

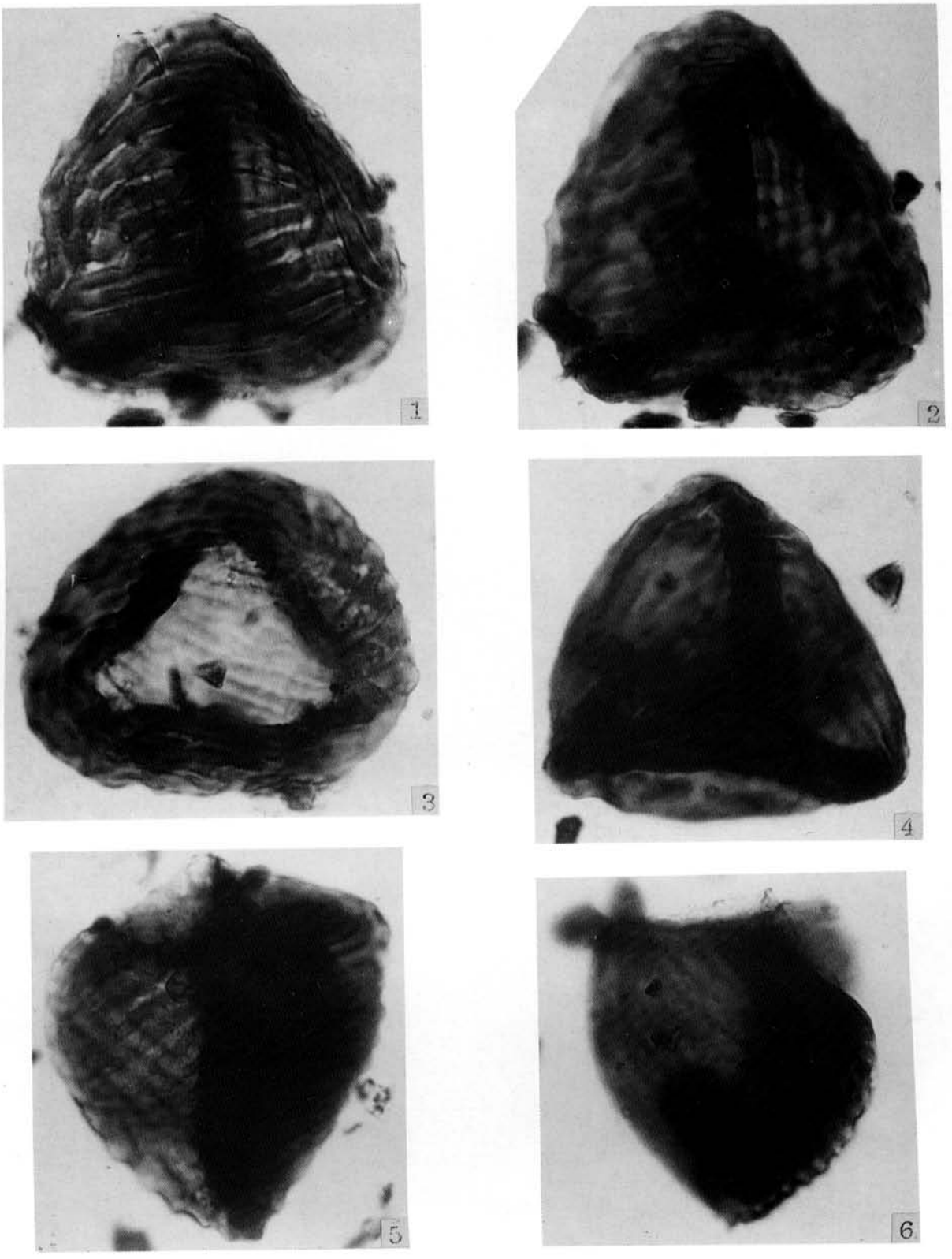


PLATE 5. Figs. 1-6. *Cicatricosisporites tersus* (Fig. 1. YTN-1 3710.70m- (1), 40:19-21; Fig. 2. YTN-1 3710.70m-(1), 40:20-22; Fig. 3. YTN-1 3710.70m-(1), 40:29-31; Fig. 4. YTN-1 3710.70m-(1), 41:3-5; Fig. 5. YTN-1 3710.70m-(2), 41:16-18; Fig. 6. YTN-1 3710.70m-(1), 41:6-8) (Figs. 1-6. x 1550)

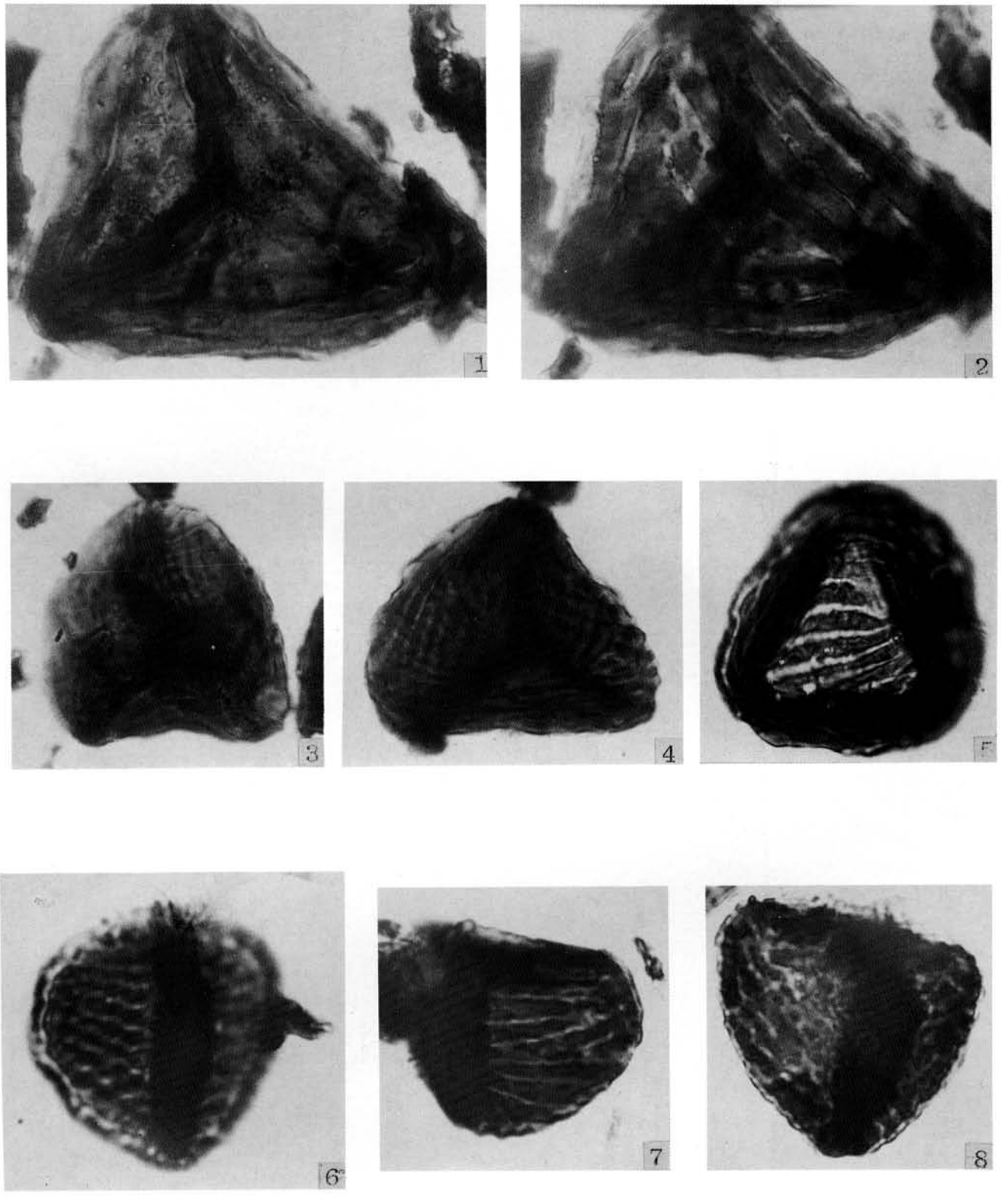


PLATE 6. Figs. 1,2. *Cicatricosisporites nankingensis* (Fig. 1. YTN-1 3710.72m-(3), 41;24;Fig. 2. YTN-1 3710.72m-(3), 41:25); Figs. 3-8. *C. vulgaris* (Fig. 3. YTN-1 3710.70m-(2), 41:13-15; Fig. 4. YTN-1 3710.70m-(1), 41:8-10; Fig. 5. YTN-1 3711.01m- (2), 85:17-38; Fig. 6. YTN-1 3710.01m-(9), 87:41A-18; Fig. 7. YTN-1 3711.01m-(9), 87:37A-15; Fig. 8. YTN-1 3711.01m-(1), 85:14-35) (Figs. 1-8. x 1550)

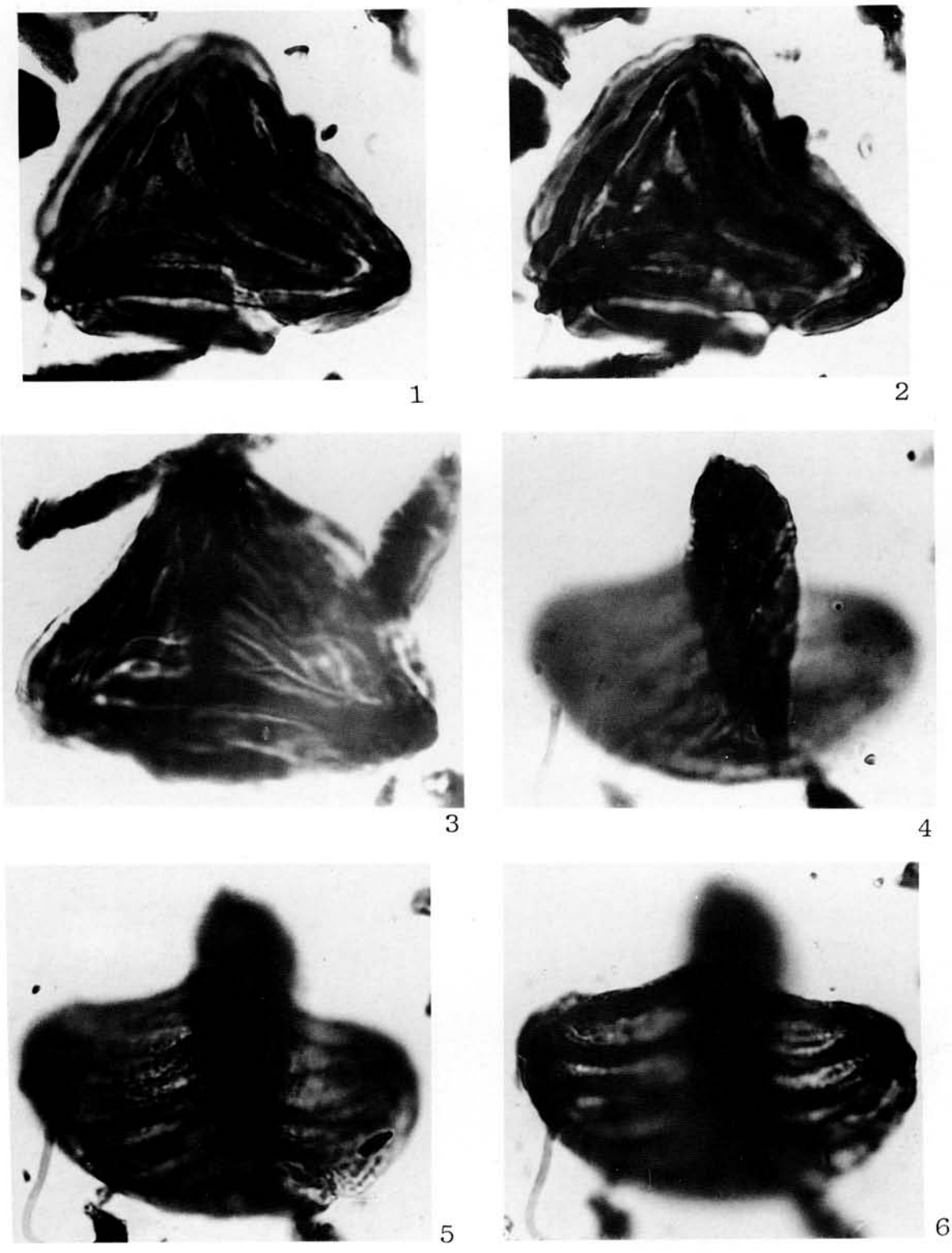
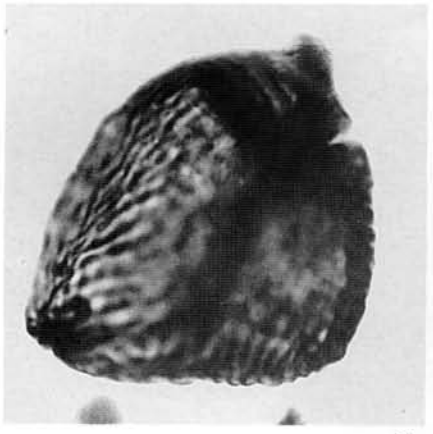


PLATE 7. Figs. 1-6. *Cicatricosisporites rarustriatus* (Fig. 1. YPT-1 3790.48m-(5), 98:21A-15; Fig. 2. YTN-1 3790.48m-(5), 98:22A-16; Fig. 3. YTN-1 3711.01m-(10), 87:16A-38; Fig. 4. YPT-1 3794.07m-(3), 98:41A-35; Fig. 5. YPT-1 3794.07m -(3), 98:40A-34; Fig. 6. YPT-1 3794.07m-(3), 98:39A-33) (Figs. 1-6. x 1550)



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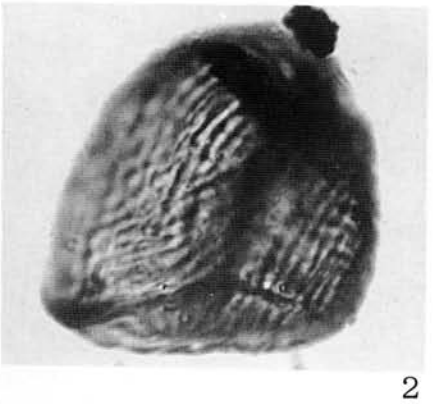

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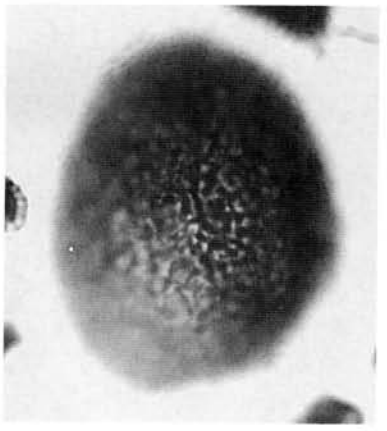

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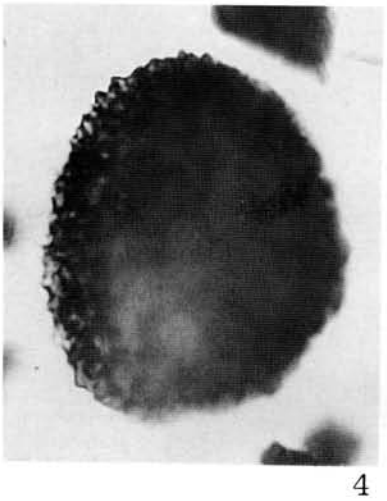

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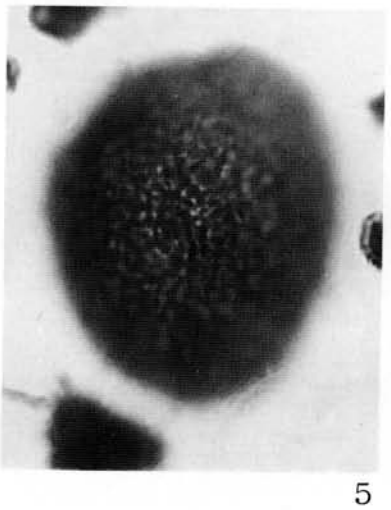

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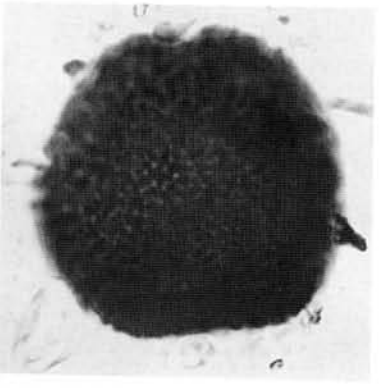

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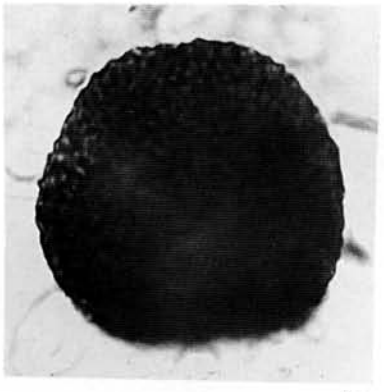

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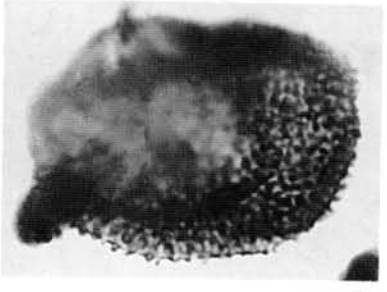

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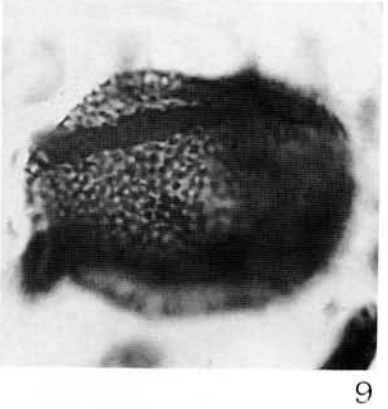

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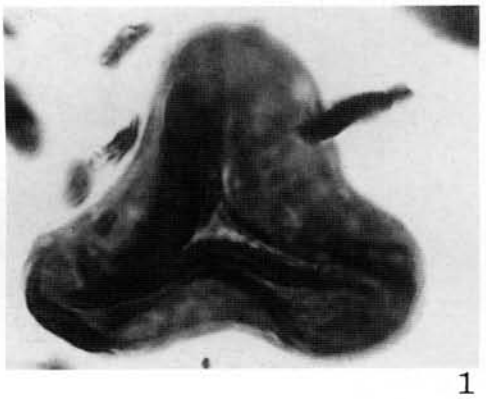
PLATE 8. Figs. 1,2. *Cicatricosisporites minor* (Fig. 1. YPT-1 3797.26m- (2), 95:19-11; Fig. 2. YPT-1 3797.26m-(2), 95:18-10); Figs. 3-9. *Osmundacidites orientalis* (Fig. 3. YPT-1 3786.37m- (2), 91:12-9; Fig. 4. YPT-1 3786.37m-(2), 91:11-8; Fig. 5. YPT-1 3786.37m-(2), 91:10-7; Fig. 6. YPT-1 3794.07m -(1), 91:18-15; Fig. 7. YPT-1 3794.07m-(1), 91:19-16; Fig. 8. YTN-1 3712.96m-(2), 91:40-37; Fig. 9. YTN-1 3712.96m- (2), 91:41-38) (Figs. 1-9. x 1550)



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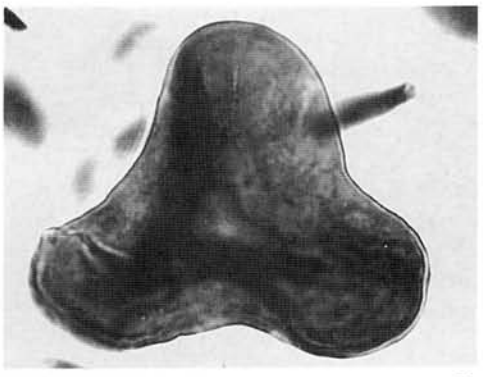

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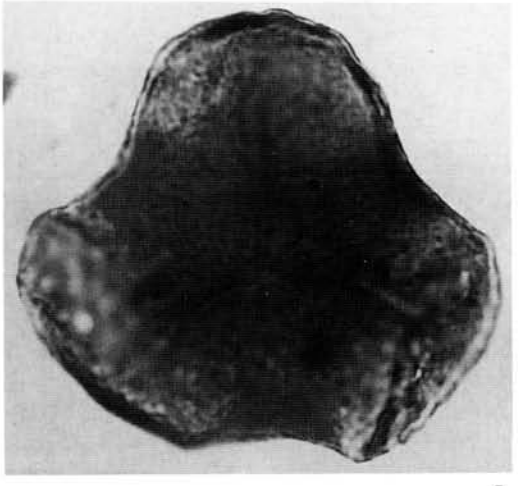

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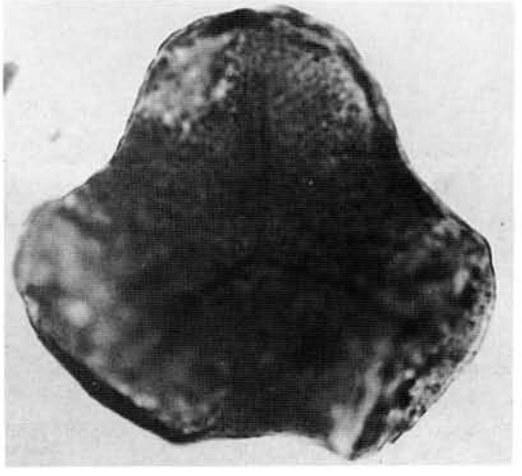

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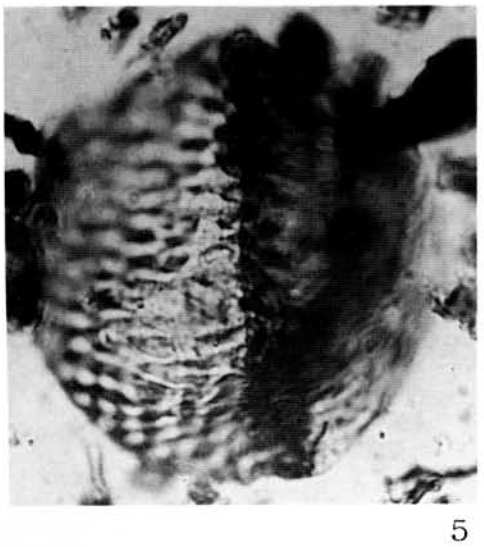

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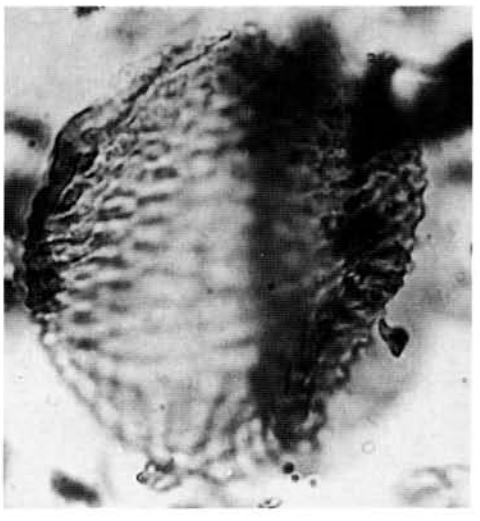

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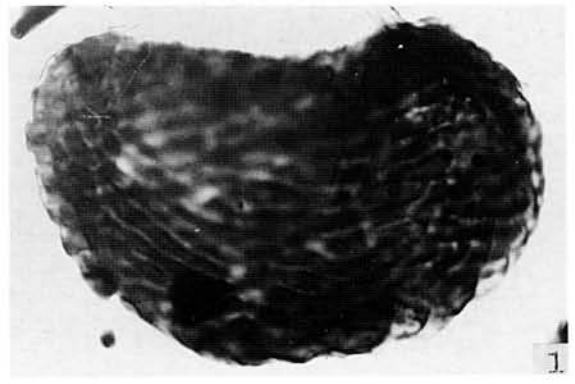
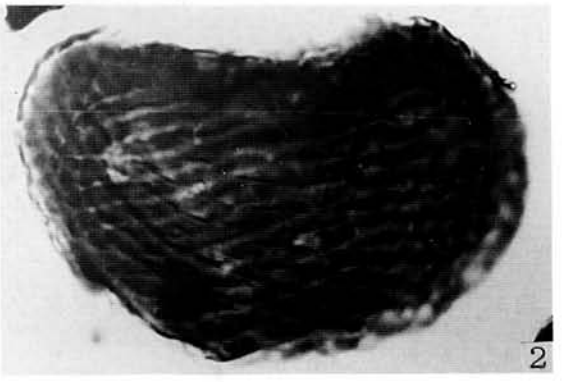
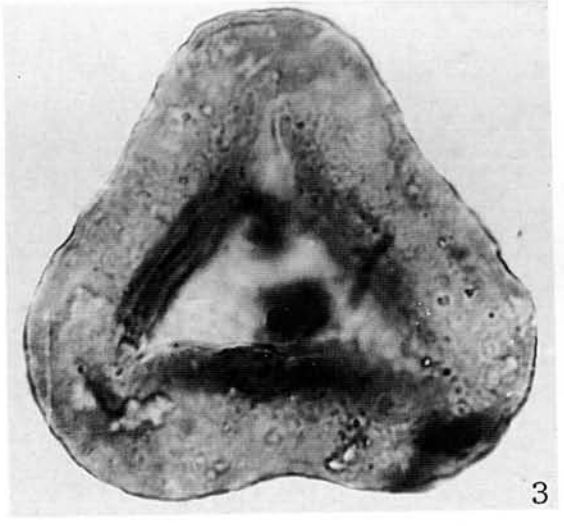
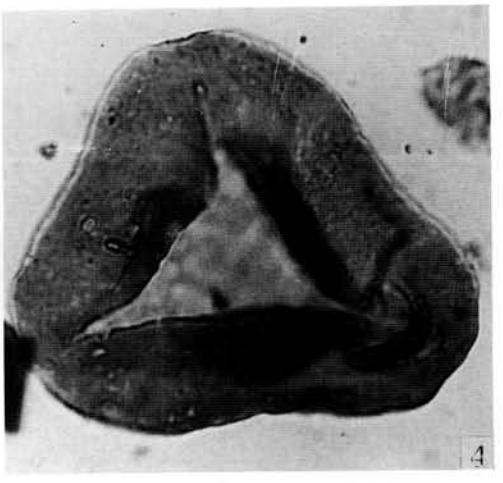
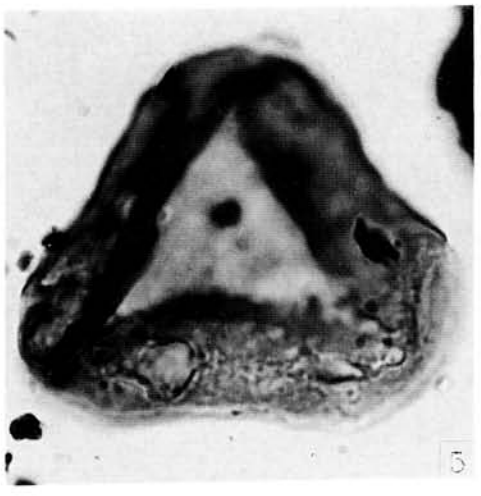
PLATE 9. Figs. 1,2. *Cyatheidites orientalis* (Fig. 1. YPT-1 3797.26m-(2), 95:13-5; Fig. 2. YPT-1 3797.26m-(2), 95:14-6); Figs. 3,4. *Concavissimisporites lepidus* (Fig. 3. YPT-1 3797.26m-(1), 94:28A-20; Fig. 4. YPT-1 3797.26m-(1), 94:27A-19); Figs. 5,6. *Cicatricosisporites communis* (Fig. 5. YTN-1 3712.96m- (2), 91:32-30; Fig. 6. YTN-1 3712.96m-(2), 91:33-31) (Figs. 1-6. x 1550)











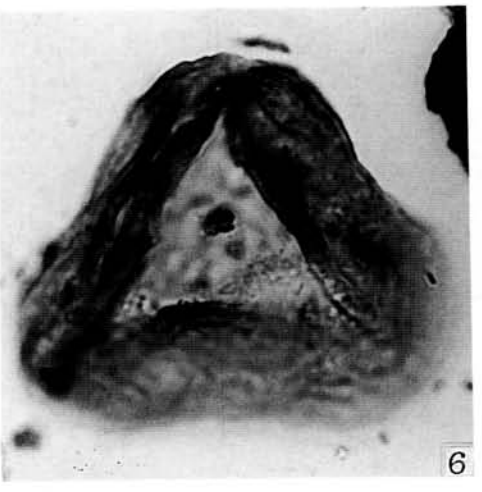


PLATE 10. Figs. 1,2. *Cicatricososporites taiwanensis* (Fig. 1. YTN-1 3710.72m -(4), 41:35-37; Fig. 2. YTN-1 3710.72m-(4), 41:36-38); Figs. 3-6. *Cyathidites formosus* (Fig. 3. YTN-1 3710.70m-(2), 41: 14-16; Fig. 4. YTN-1 3710.70m-(1), 41:1-3; Fig. 5. YTN-1 3710.70m-(1), 40:27-29; Fig. 6. YTN-1 3710.70m-(1), 40:28-39) (Figs. 1-6. x 1550)

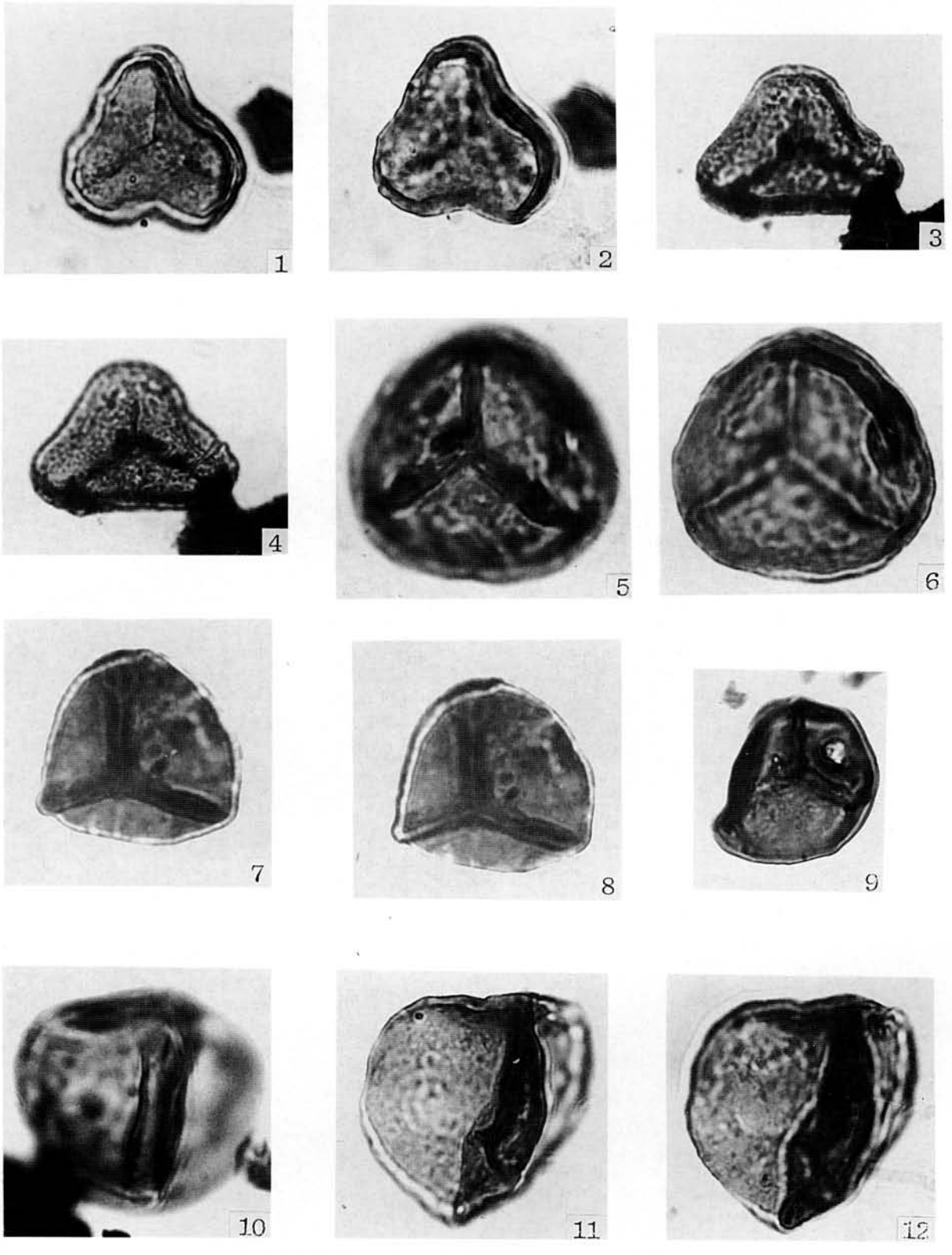


PLATE 11. Figs. 1,2. *Cyathidites crassimarginatus* (Fig. 1. YTN-1 3711.01m -(6), 86:2A-24; Fig. 2. YTN-1 3711.01m-(6), 86:3A-25); Figs. 3,4. *Concavissimisporites lepidus* (Fig. 3. YTN-1 3711.01m-(9), 87:5A-27; Fig. 4. YTN-1 3711.01m-(9), 87:4A-26); Figs. 5,6. *Biretisporites cretaceous* (Fig. 5. YTN-1 3711.01m-(7), 87:26A-4; Fig. 6. YTN-1 3711.01m-(7), 87:27A-5); Figs. 7-9. *Biretisporites crassimagosus* (Fig. 7. YTN-1 3711.01m-(8), 87:32A-10; Fig. 8. YTN-1 3711.01m-(8), 87:33A-11; Fig. 9. YTN-1 3702.75m-(4), 84:33-10); Figs. 10-12. *Triplanosporites cretaceous* (Fig. 10. YTN-1 3703.56m-(1), 85:42-19; Fig. 11. YTN-1 3711.01m-(6), 86:7A-29; Fig. 12. YTN-1 3711.01m-(6), 86:8A-30) (Figs. 1-2, 5-12 x 1550; Figs. 3,4 x 600)

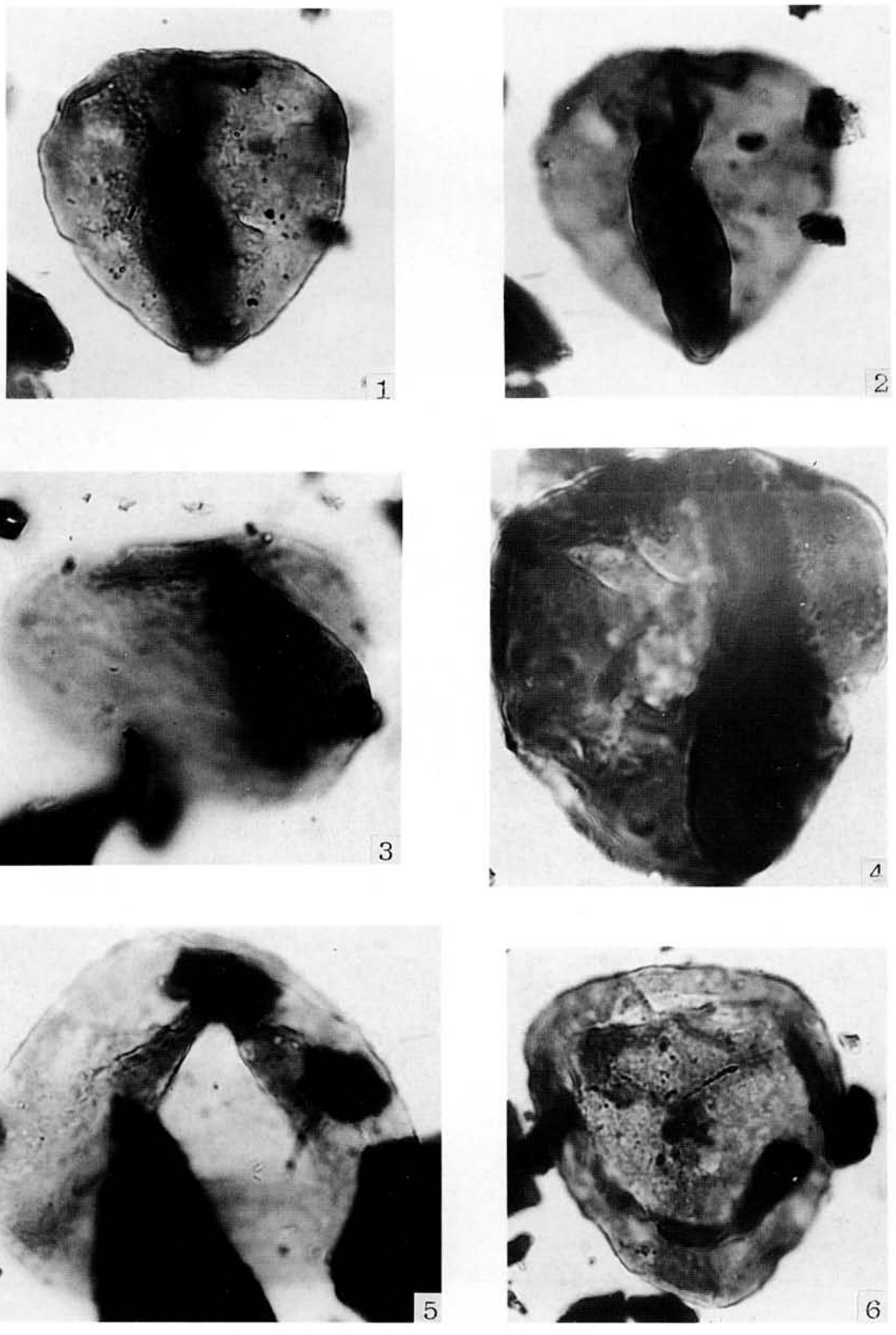
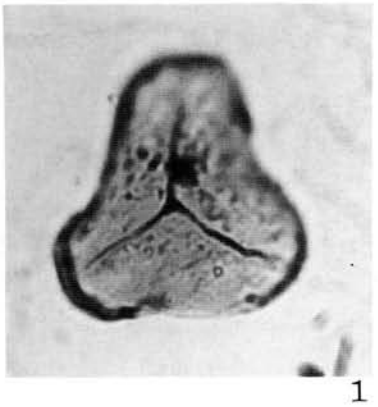


PLATE 12. Figs. 1-3. *Triplanosporites formosus* (Fig. 1. YTN-1 3710.70m- (1), 41:1-13; Fig. 2. YTN-1 3710.70m-(1), 41:10-12; Fig. 3. YTN-1 3710.70m-(2), 41:18-20); Fig. 4. *Triplanosporites figuratus* (YTN-1 3702.75m-(4), 84:39-16); Figs. 5,6. *Leiotriletes communis* (Fig. 5. YTN-1 3710.70m-(2), 41:20; Fig. 6. YTN-1 3710.70m-(1), 41:21) (Figs. 1-6. x 1550)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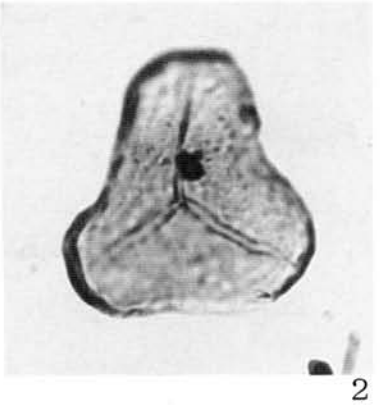
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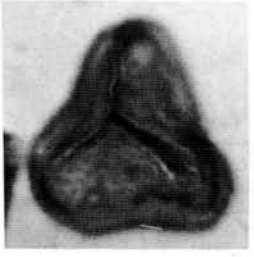
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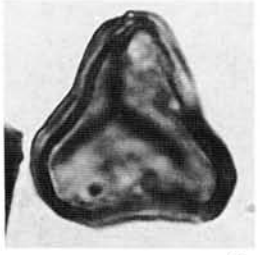
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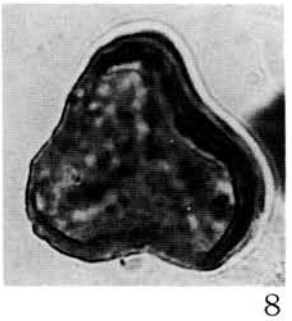
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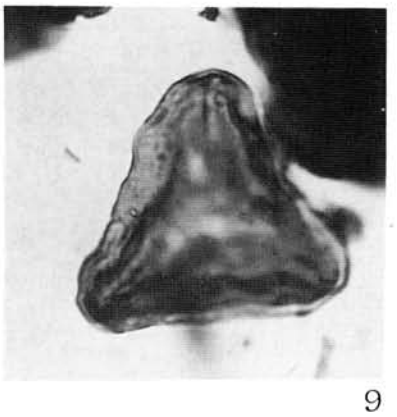
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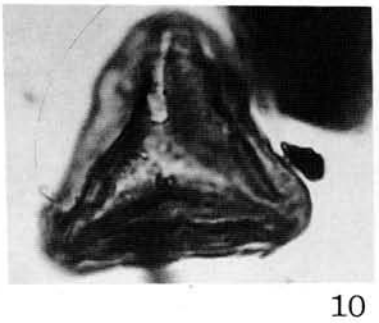
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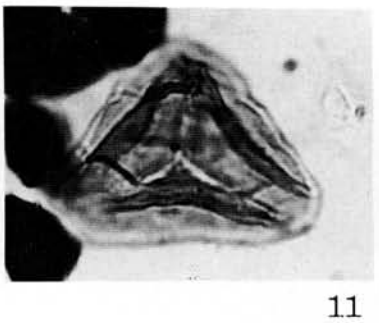
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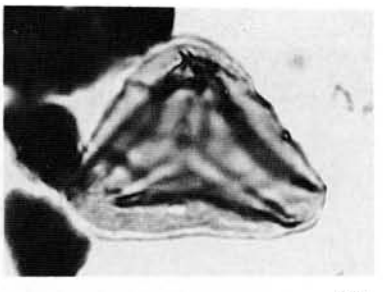
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PLATE 13. Figs. 1-3. *Cyathidites parvus* (Fig. 1. YPT-1 3794.07m-(3), 93: 11-9; Fig. 2. YPT-1 3794.07m-(3), 93:12-10; Fig. 3. YPT-1 3794.07m-(3), 93:15-13); Figs. 4-7. *C. minus* (Fig. 4. YPT-1 3786.37m-(2), 92:10-8; Fig. 5. YPT-1 3786.37m-(2), 94:9-7; Fig. 6. YPT-1 3786.37m-(3), 92:18-16; Fig. 7. YPT-1 3786.37m-(3), 92:19-17); Figs. 8. *C. crassimarginatus* (YTN-1 3711.01m-(6), 86:3A-25); Figs. 9-12. *Gleicheniidites orientalies* (Fig. 9. YPT-1 3786.37m-(1), 97:37-34; Fig. 10. YPT-1 3786.37m-(1), 91:36-33; Fig. 11. YPT-1 3797.26m-(4), 96:19-12; Fig. 12. YPT-1 3797.26m-(4), 96:20-13) (Figs. 1-12. x 1550)

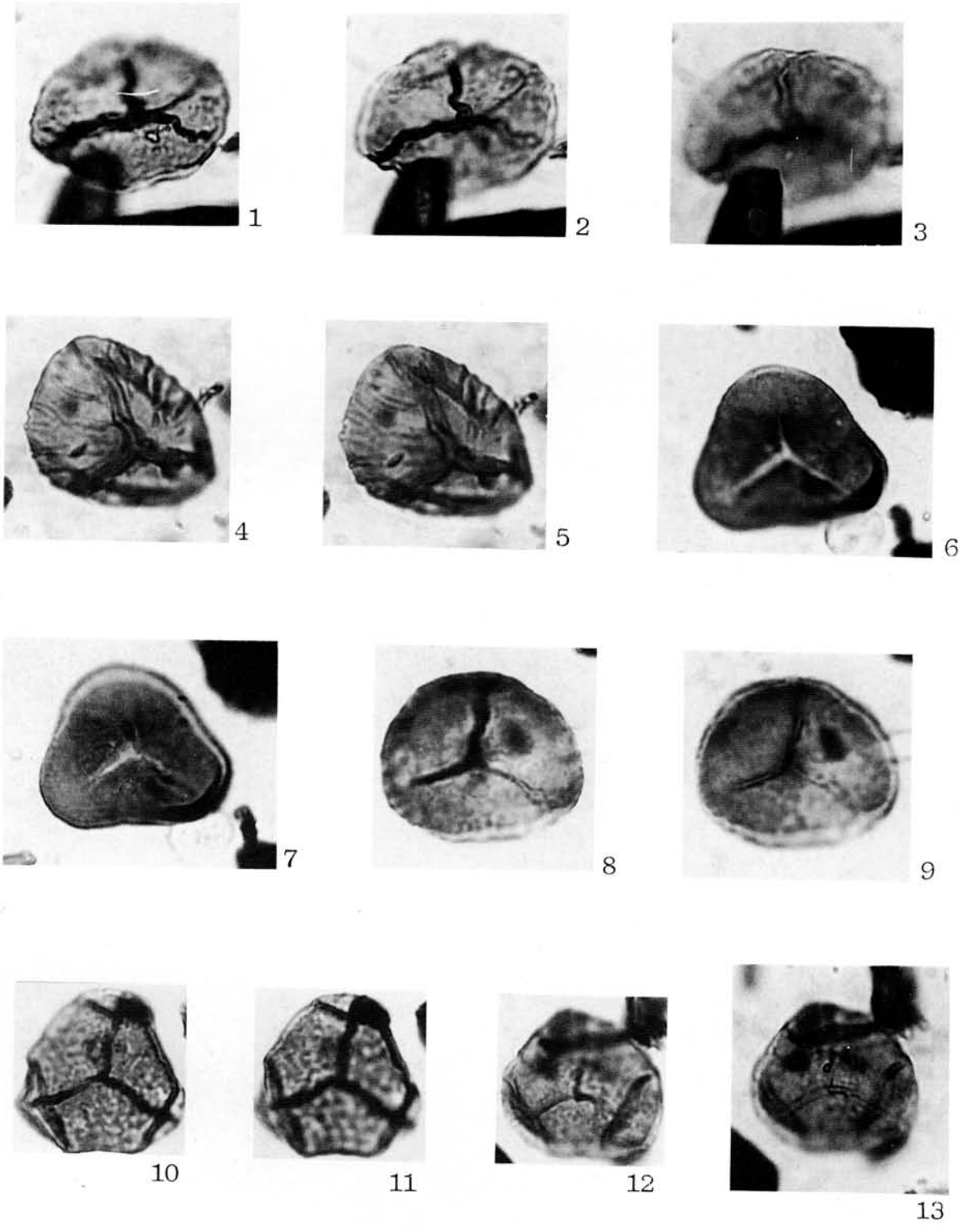
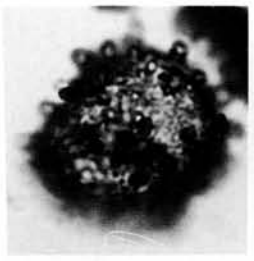


PLATE 14. Figs. 1-3. *Undulatisporites parvirotundus* (Fig. 1. YPT-1 3797.26m-(4), 96:16-9; Fig. 2. YPT-1 3797.26m-(4), 96:17-10; Fig. 3. YPT-1 3797.26m-(4), 96:18-11); Figs. 4,5. *Costatisporites taiwanensis* (Fig. 4. YTN-1 3700.07m-(2), 91:4-1; Fig. 5. YTN-1 3700.07m-(2), 91:5-2); Figs. 6,7. *Deltoidospora parvus* (Fig. 6. YPT-1 3794.07m-(1), 99:13-6; Fig. 7. YPT-1 3794.07m-(1), 99:14-7); Figs. 8,9. *Biretisporites parvus* (Fig. 8. YPT-1 3794.07m-(1), 91:39-36; Fig. 9. YPT-1 3794.07m-(1), 91:38-35); Figs. 10-13. *Cibotumspora taiwaniana* (Fig. 10. YPT-1 3797.26m-(2), 95:11-2; Fig. 11. YPT-1 3797.26m-(2), 95:10-3; Fig. 12. YPT-1 3797.26m-(2), 95:16-8; Fig. 13. YPT-1 3797.26m-(2), 95:15-7) (Figs. 1-13. x 1550)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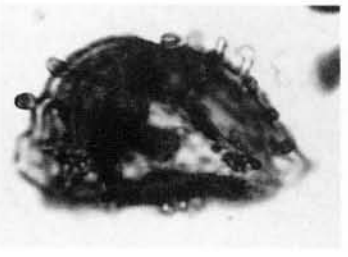
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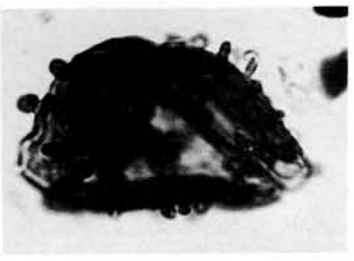
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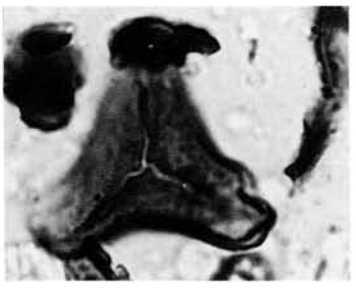
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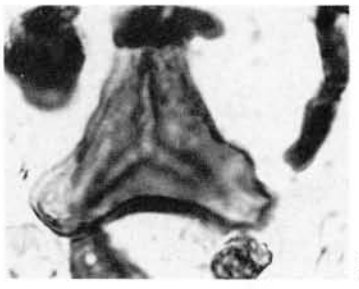
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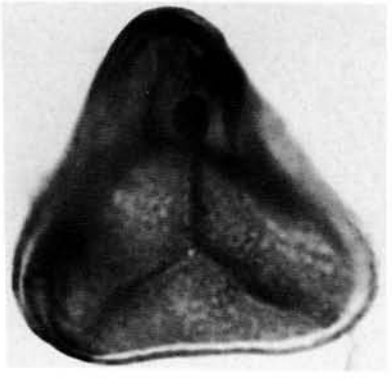
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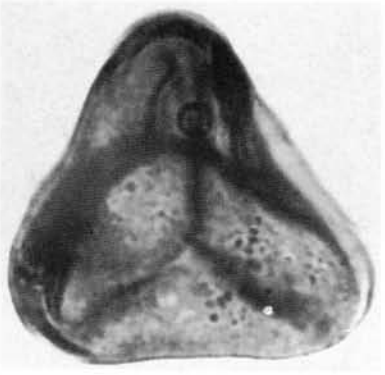
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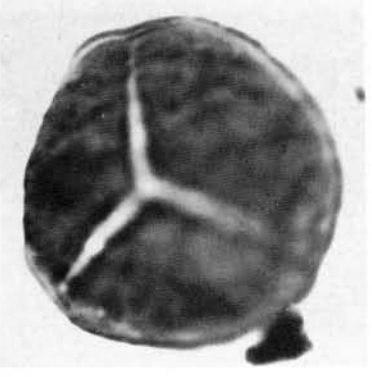
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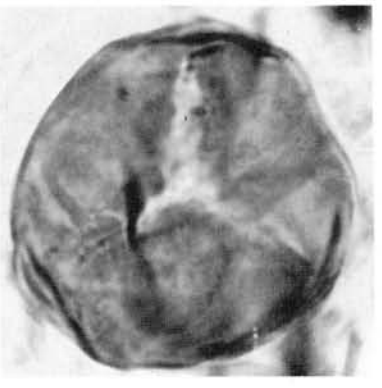
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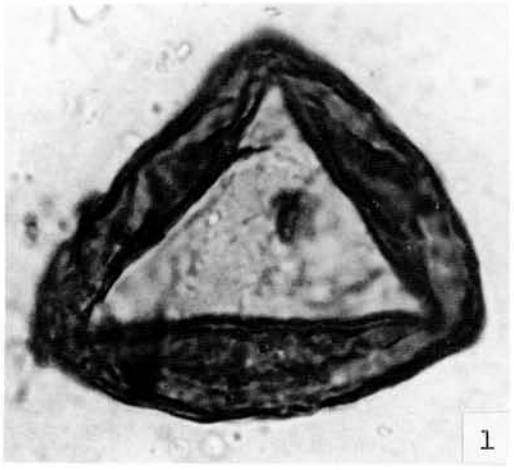
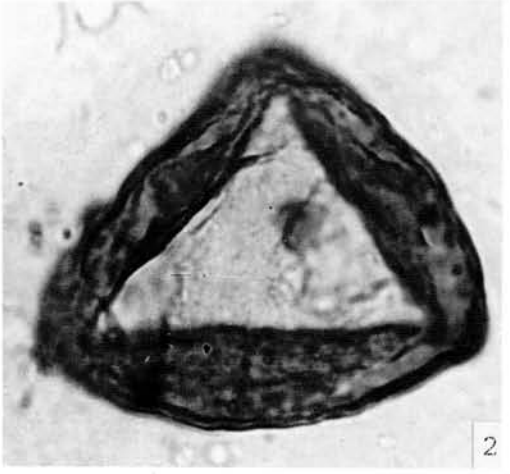
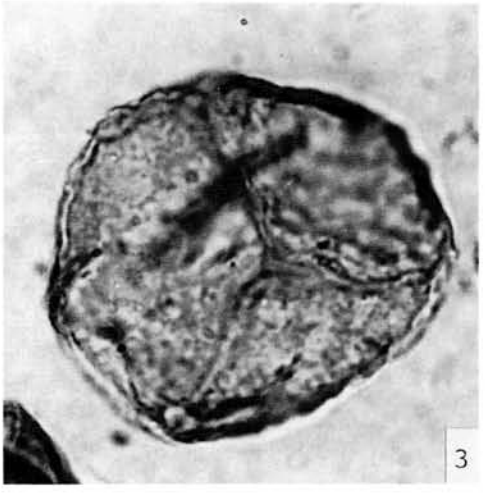
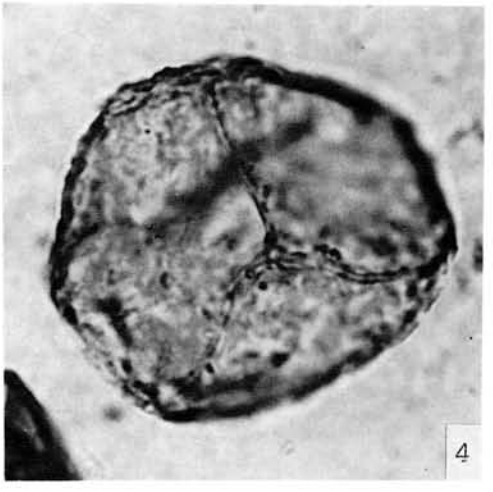
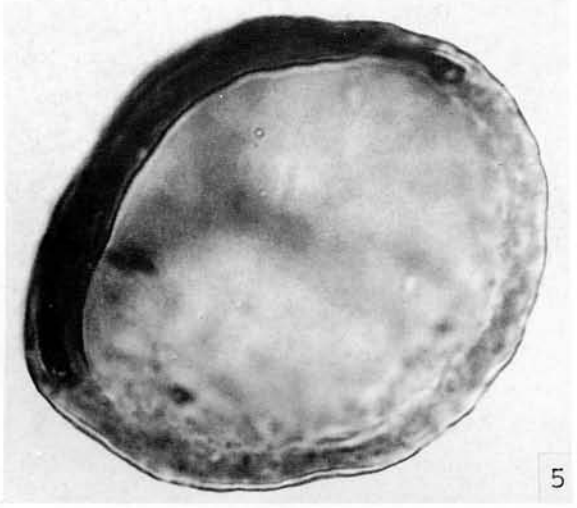
PLATE 15. Figs. 1-4. *Bacuinaperturites taiwanensis* (Fig. 1. YPT-1 3786.57m-(4), 92:29-27; Fig. 2. YPT-1 3786.57m-(4), 92:28-26; Fig. 3. YPT-1 3797.26m-(4), 95:36-28; Fig. 4. YPT-1 3797.26m-(3), 95:35-27); Figs. 5,6. *Cyatheidites formosus* (Fig. 5. YPT-1 3794.07m-(1), 99:11-4; Fiog. 6. YPT-1 3794.07m-(1), 99:12-5); Figs. 7,8. *Granulatisporites taiwanensis* (Fig. 7. YPT-1 3794.07m-(3), 93:7-5; Fig. 8. YPT-1 3794.07m-(3), 93:8-6); Figs. 9,10. *Granulatisporites parvus* (Fig. 9. YPT-1 3794.07m-(5), 94:14A-6; Fig. 10. YPT-1 3794.07m-(5), 94:13A-5); Figs. 11,12. *Leiotriletes rotundus* (Fig. 11. YPT-1 3794.07m-(3), 93:22-20; Fig. 12. YPT-1 3794.07m-(2), 93:4-2) (Figs. 1-12. x 1550)











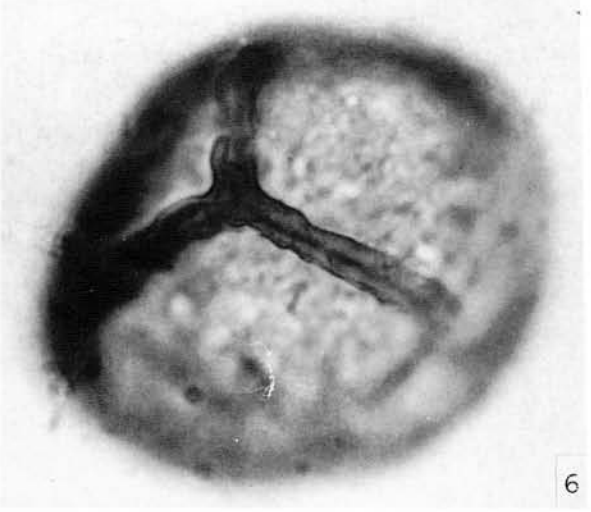


PLATE 16. Figs. 1,2. *Leiotriletes membranus* (Fig. 1. YTN-1 3722.1-3722.3m-(4), 119:1A; Fig. 2. YTN-1 3722.1-3722.3m-(4), 119:0A); Figs.3,4. *Scabratisporites taiwanensis* (Fig. 3. YTN-1 3722.1- 3722.3m-(4), 118:2; Fig. 4. YTN-1 3722.1-3722.3m-(4), 118:1); Figs. 5,6. *Biretisporites taiwanensis* (Fig. 5. YTN-1 3722.1-3722.3m-(2), 117:8; Fig. 6. YTN-1 3722.1-3722.3m-(2), 117:7) (Figs. 1-6. x 1550)

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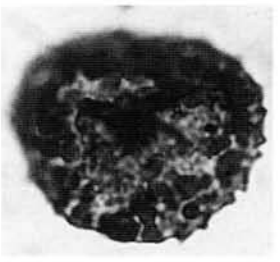
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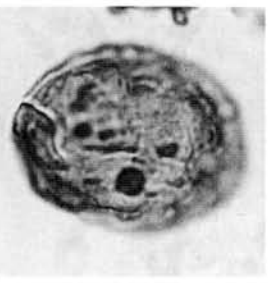
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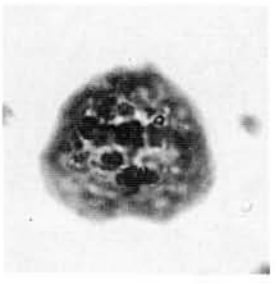
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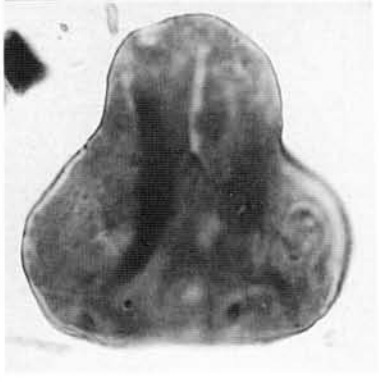
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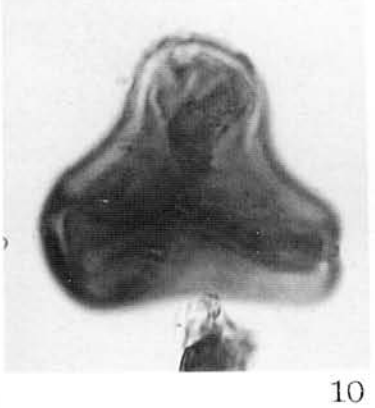
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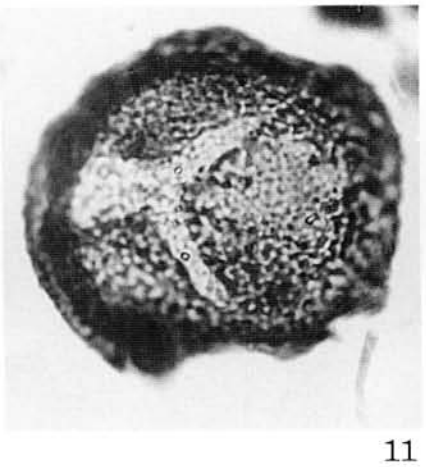
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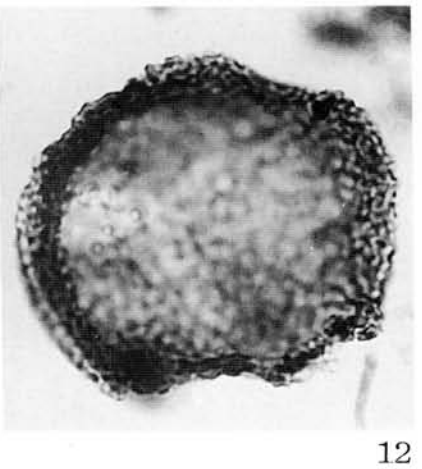
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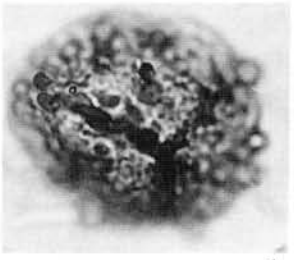
PLATE 17. Figs. 1,2. *Echinatinaperturites taiwanensis* (Fig. 1. YPT-1 3786.37m-(2), 92:13-11; Fig. 2. YPT-1 3786.37m-(2), 92:14-12); Figs. 3-6. *Camerosporis taiwanensis* (Fig. 3. YPT-1 3797.26m-(2), 94:42A-34; Fig. 4. YPT-1 3797.26m-(2), 94:41A-33; Fig. 5. YPT-1 3797.26m-(4), 96:9-2; Fig. 6. YPT-1 3797.26m-(4), 96:10-3); Figs. 7-10. *Cyathidites mundulus* (Fig. 7. YPT-1 3797.26m-(1), 94:22A-14; Fig. 8. YPT-1 3797.26m-(1), 94:21A-13; Fig. 9. YPT-1 3794.07m-(3), 98:27A-21; Fig. 10. YPT-1 3794.07m-(3), 98:28A-22); Figs. 11,12. *Osmundacidites orientalis* (Fig. 11. YPT-1 3797.26m-(3), 95:29-21; Fig. 12. YPT-1 3797.26m-(3), 95:28-20) (Figs. 1-12. x 1550)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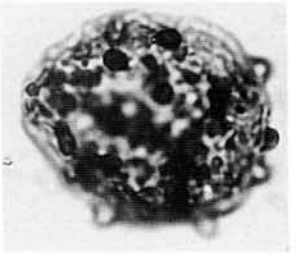
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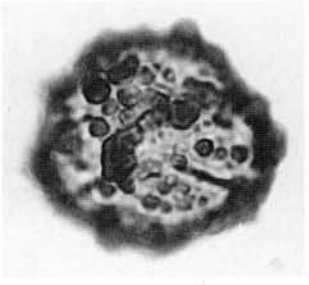
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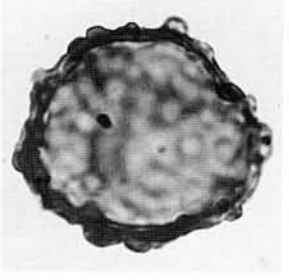
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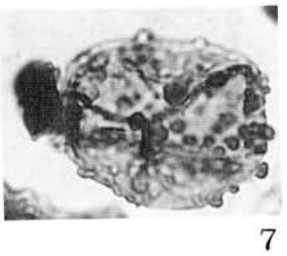
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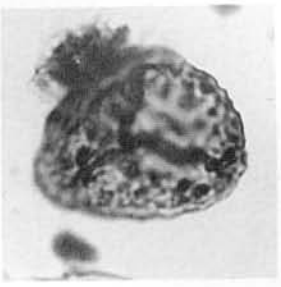
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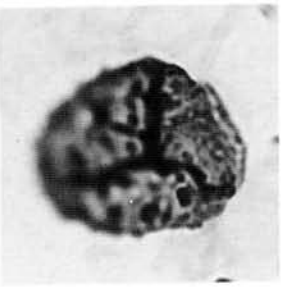
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PLATE 18. Figs. 1-5. *Kewanaesporites ;rotundus* (Fig. 1. YPT-1 3786.37m-(3), 92:20-18; Fig. 2. YPT-1 3786.37m-(3), 92:22-20; Fig. 3. YPT-1 3786.37m-(3), 92:21-19; Fig. 4. YPT-1 3797.26m-(4), 96:15-8; Fig. 5. YPT-1 3797.26m-(4), 96:14-7); Figs. 6-12. *K. taiwanensis* (Fig. 6. YPT-1 3797.26m-(3), 95:37-29; Fig. 7. YPT-1 3797.26m-(3), 95:38-30; Fig. 8. YPT-1 3786.37m-(3), 92:23-21; Fig. 9. YPT-1 3786.37m-(3), 92:24-22; Fig. 10. YPT-1 3786.37-m(2), 91:13-10; Fig. 11. YPT-1 3786.37m-(2), 91:14-11; Fig. 12. YPT-1 3794.07m-(3), 93:26-24) (Figs. 1-12. x 1550)

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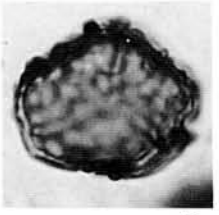
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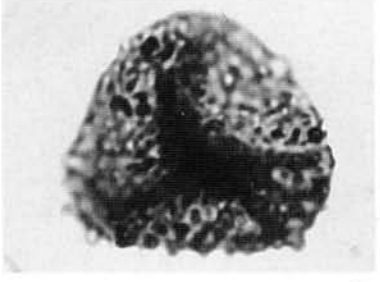
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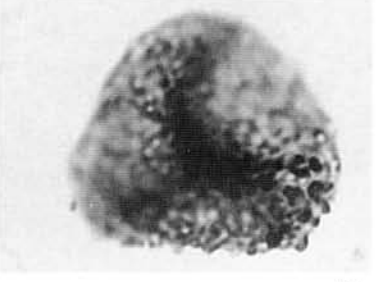
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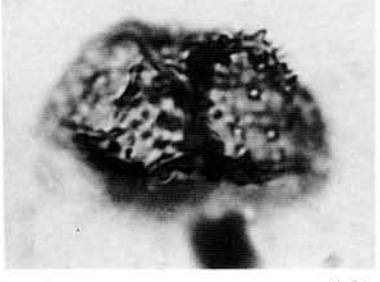
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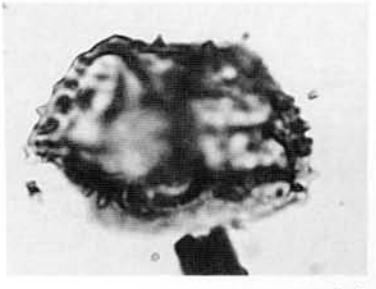
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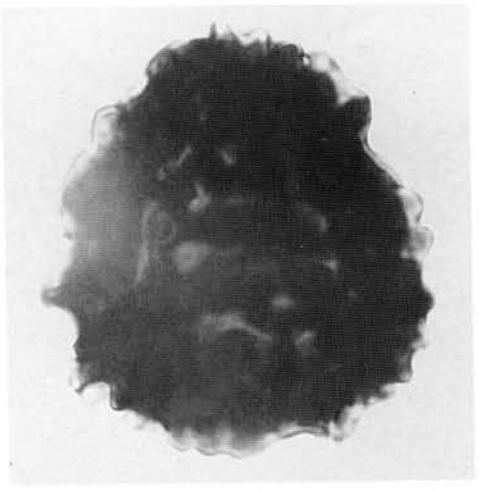
PLATE 19. Figs. 1-4. *Kewanaesporites taiwanensis* (Fig. 1. YPT-1 3797.26m-(1), 95:3-39; Fig. 2. YPT-1 3797.26m-(4), 95:2-38; Fig. 3. YPT-1 3797.26m-(3), 95:33-25; Fig. 4. YPT-1 3797.26m-(3), 95:34-26); Figs. 5-8. *K. rarigranulatus* (Fig. 5. YPT-1 3797.26m-(3), 94:37-29; Fig. 6. YPT-1 3797.26m-(2), 94:36-28); Fig. 7. (YPT-1 3797.26m-(4), 95: 44-36; Fig. 8. YPT-1 3797.26m-(4), 95:1-37); Figs. 9-11. *Kewanaesporites formosus* (Fig. 9. YPT-1 3794.07m-(4), 93:34-32; Fig. 10. YPT-1 3794.07m-(4), 93:33-31; Fig. 11. YPT-1 3794.07m-(4), 93:35-33); Figs. 12-14. *Echinatisporites taiwanensis* (Fig. 12. YPT-1 3797.26m-(4), 96:11-4; Fig. 13. YPT-1 3797.26m-(4), 96:12-5; Fig. 14. YPT-1 3797.26m-(4), 96:13-6) (Figs. 1-14. x 1550)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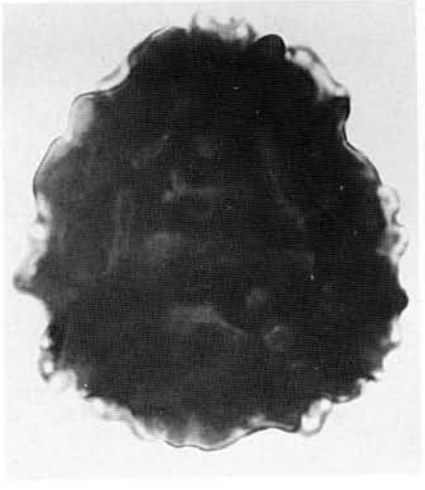
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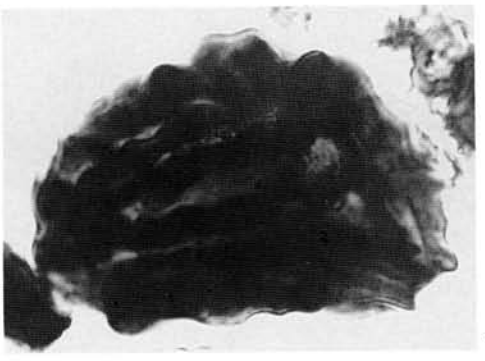
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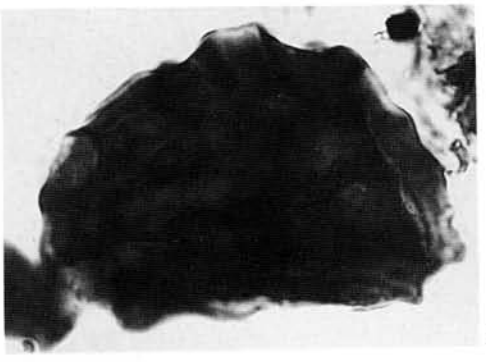
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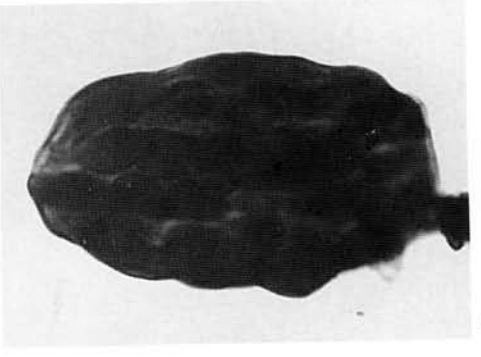
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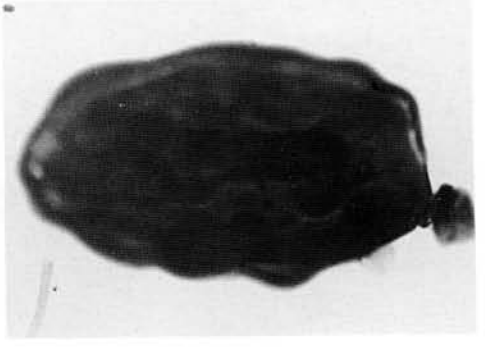
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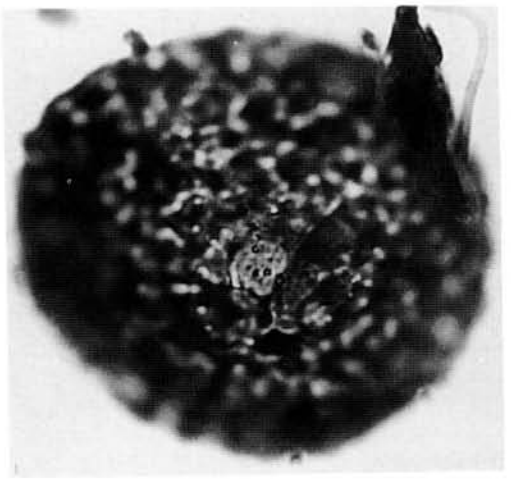
PLATE 20. Figs. 1-5. *Klukisporites speciosus* (Fig. 1. YPT-1 3794.07-09m-(1), 91:15-12; Fig. 2. YPT-1 3794.07m-(1) 91:16-13; Fig. 3. YPT-1 3794.07m-(2) 94:18A-10; Fig. 4. YPT-1 3794. 07m-(1), 99:9-3; Fig. 5. YPT-1 3794.07m-(1) 99:10-2); Figs. 6,7. *Leptolepidites taiwanensis* (Fig. 6. YPT-1 3794.07m-(2), 99:29-22; Fig. 7. YPT-1 3794.07m-(2) 99:30-23) (Figs. 1-7. x 1550)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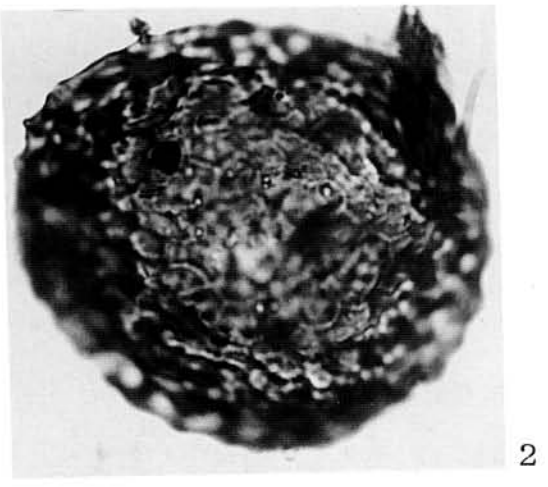
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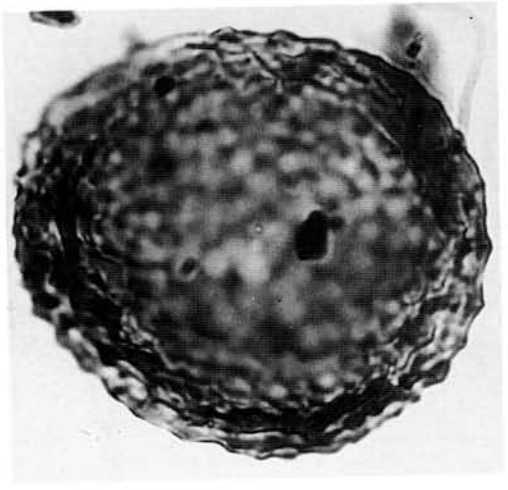
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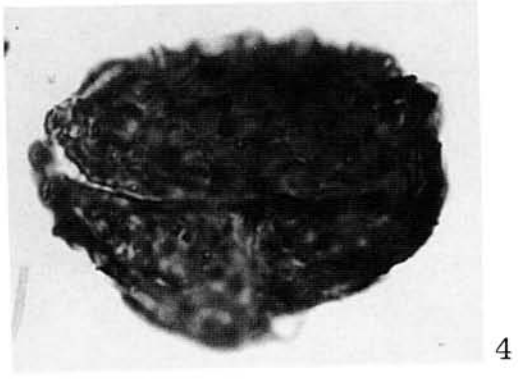
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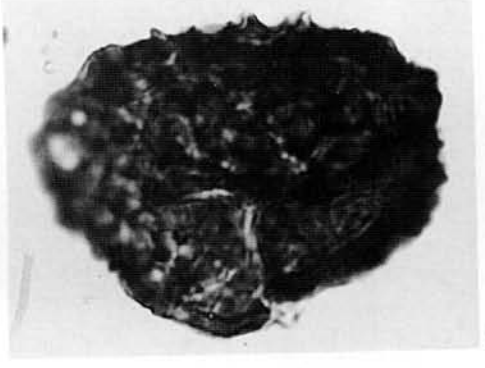
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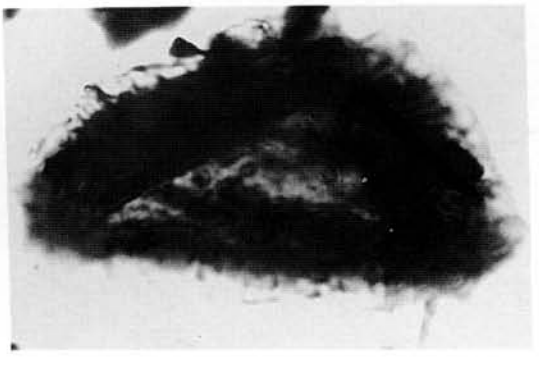
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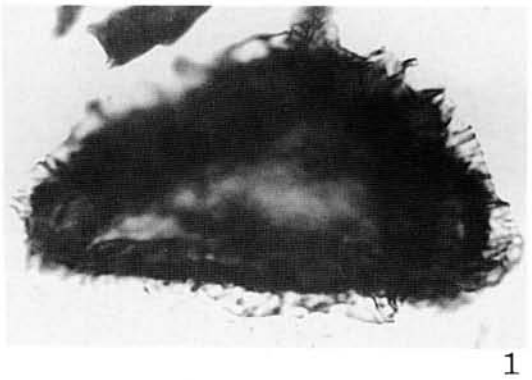
PLATE 21. Figs. 1-5. *Retitriletes aerolatus* (Fig. 1. YPT-1 3794.07m-(2), 99:28-21; Fig. 2. YPT-1 3794.07m-(2), 99:27-20; Fig. 3. YPT-1 3794.07m-(2), 99:26-19; Fig. 4. YPT-1 3794.07m-(1), 99:16-9; Fig. 5. YPT-1 3794.07m-(1), 99:17-10); Fig. 6. *Callialasporites striatus* (YPT-1 3797. 26m-(3), 95:31-27) (Figs. 1-6. x 1550)



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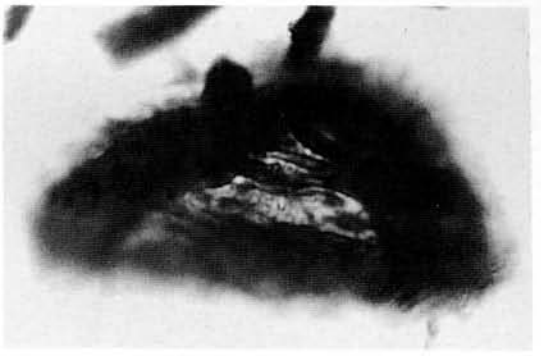

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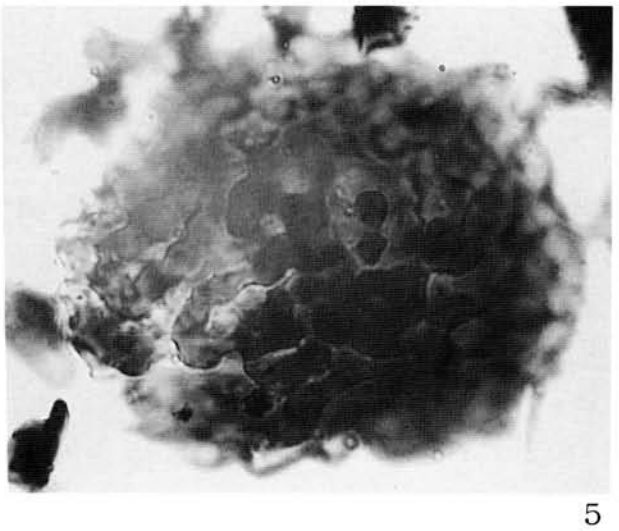

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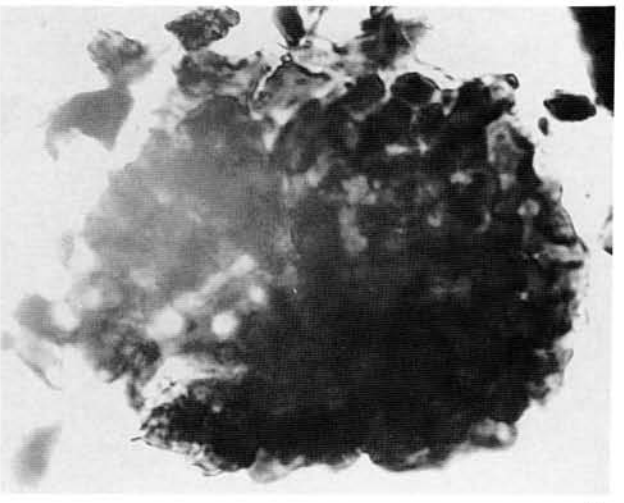

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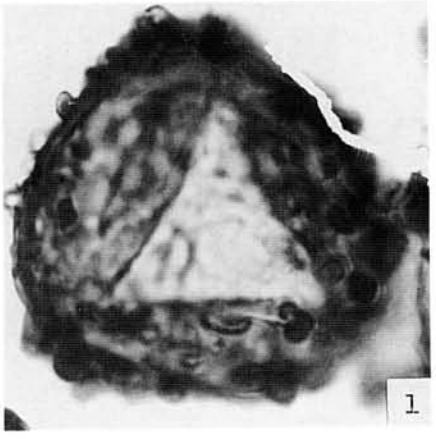
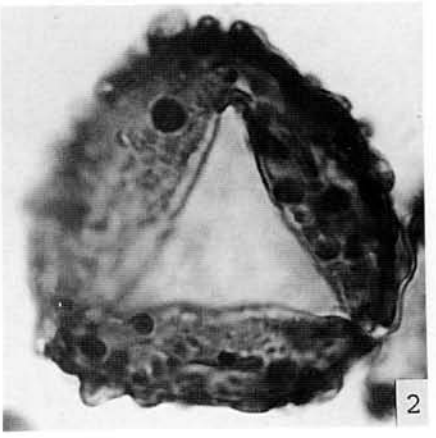
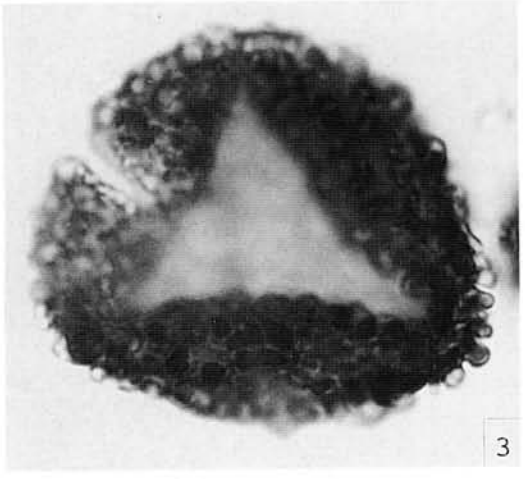
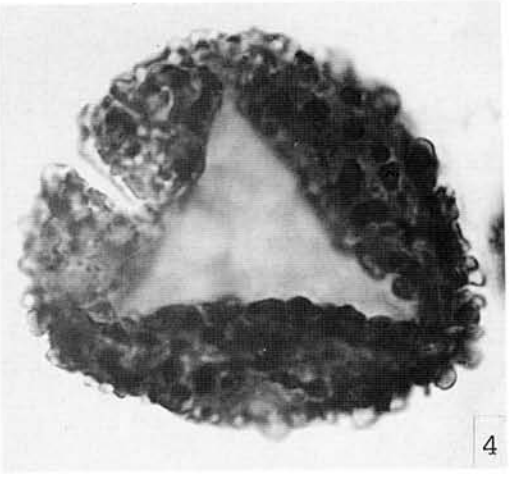
PLATE 22. Figs. 1,2. *Callialasporites striatus* (Fig. 1. YPT-1 3797.26m-(3), 95:30-22; Fig. 2. YPT-1 3797.26m-(3), 95: 32-24); Figs. 3-6. *Corrugatisporites taiwanensis* (Fig. 3. YTN-1 3712. 96m-(2), 91:34-31; Fig. 4. YTN-1 3712.96m-(2),91: 35-32; Fig. 5. YTN-1 3712.96m-(1), 91:28-25; Fig. 6. YTN-1 3712. 96m-(1), 91:29-26) (Figs. 1-6. x 1550)









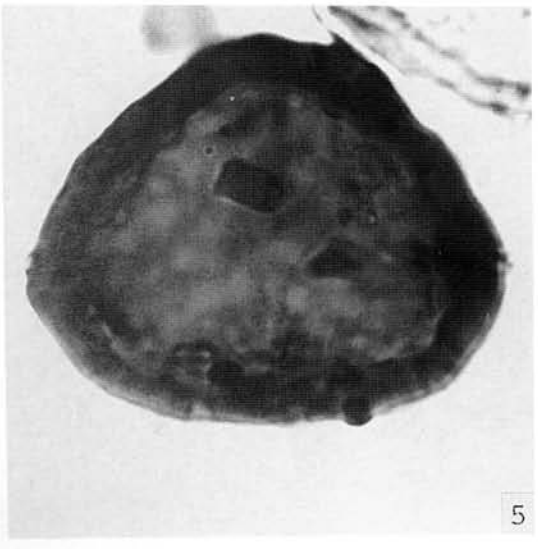


PLATE 23. Figs. 1-4. *Gemmatriletes speciosus* (Fig. 1. YTN-1 3722.1-3722.3m-(5), 120:31; Fig. 2. YTN-1 3722.1-3722.3m-(5), 120-30; Fig. 3. YTN-1 3722.1-3722.3m-(3), 117:25; Fig. 4. YTN-1 3722.1-3722.3m-(3), 117:26); Figs. 5,6. *Gemmatriletes crassimaginatus* (Fig. 5. YTN-1 3722. 1-3722.3m-(4), 118:17; Fig. 6. YTN-1 3722.10-3722. 3m-(4), 118:16) (Figs. 1-6. x 1550)

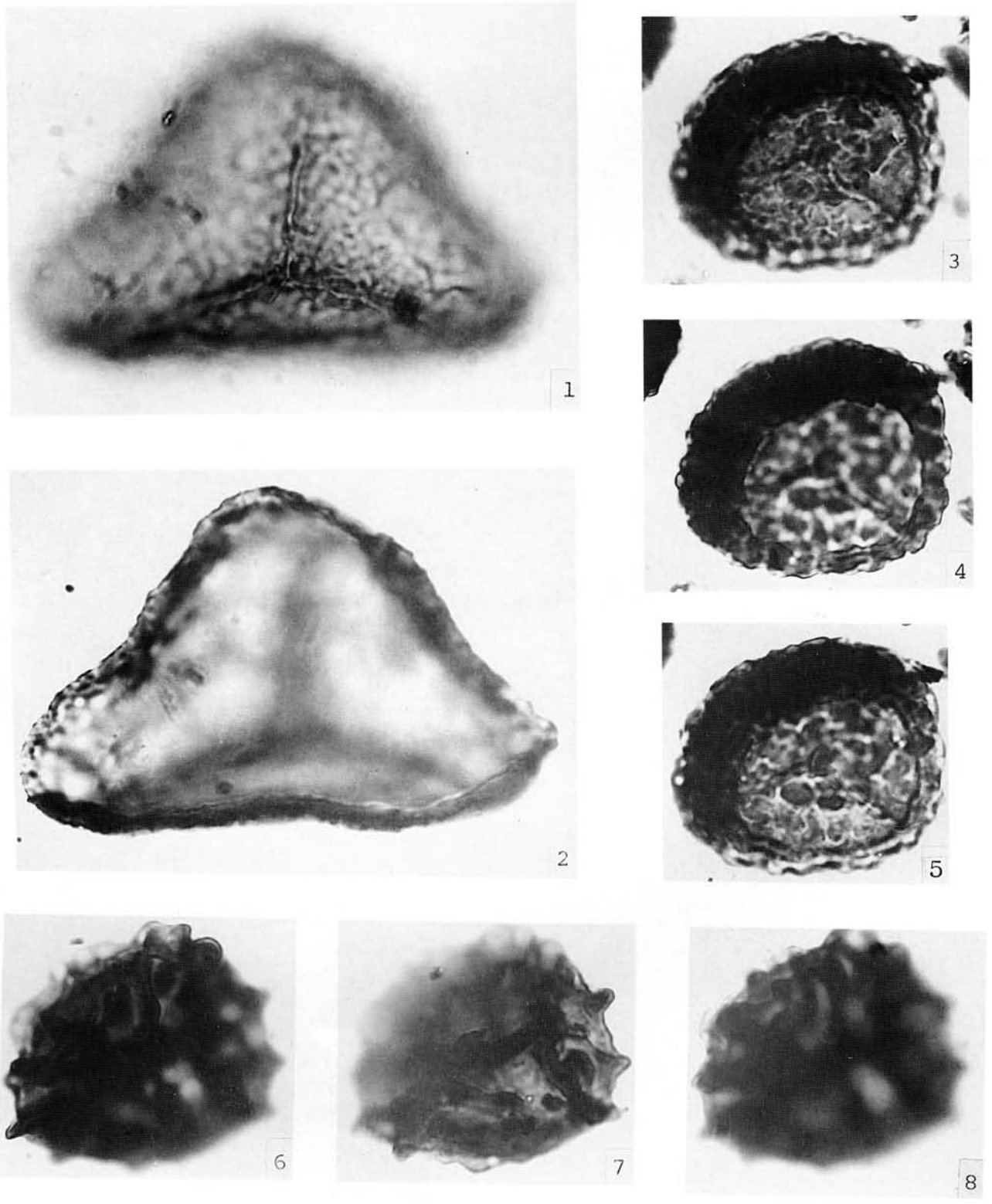
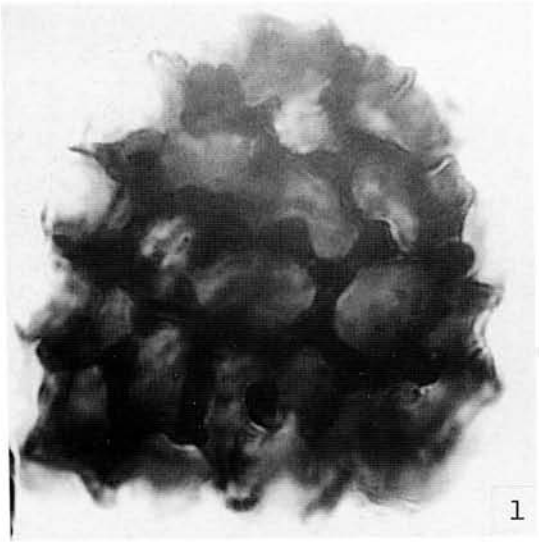
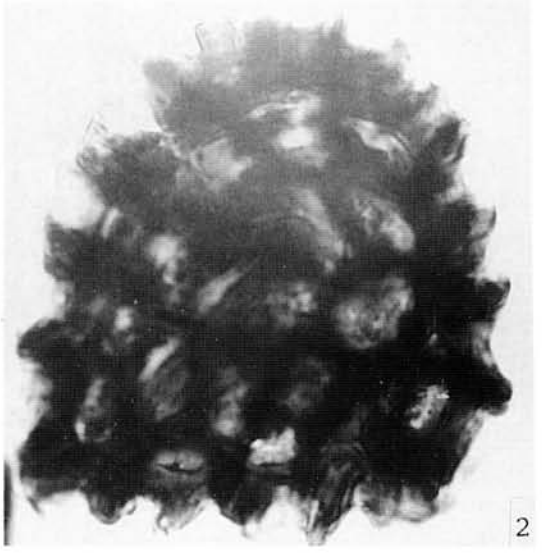
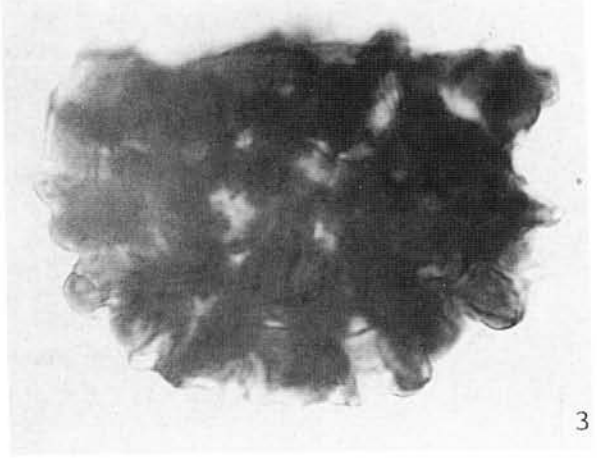
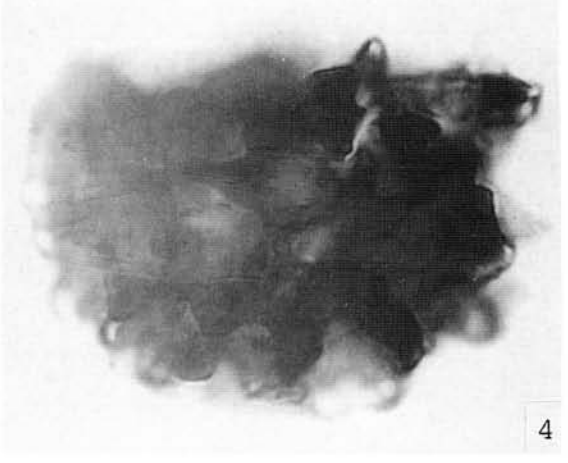


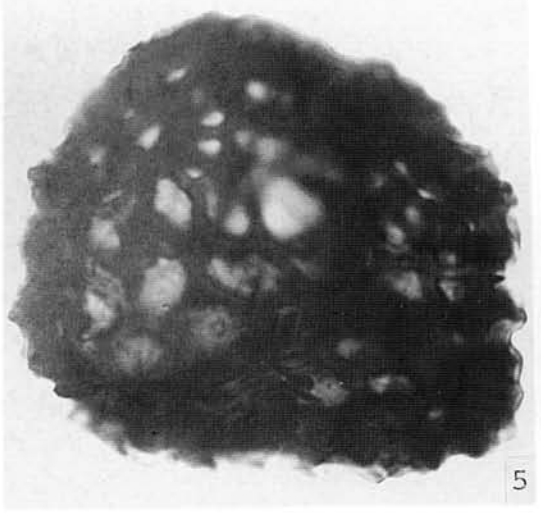
PLATE 24. Figs. 1,2. *Concavissimisporites lepidus* (Fig. 1. YTN-1 3722.1-3722.3-(5), 121:2; Fig. 2. YTN-1 3722.1-3722. 3m-(5), 121:0); Figs. 3-5. *Triassisporis taiwaniana* (Fig. 3. YTN-1 3710.70- 3710.82m-(4) 121:23; Fig. 4. YTN-1 3710.70-3710. 82m-(4), 121:25; Fig. 5. YTN-1 3710.70-3710.82m-(4), 121:24); Figs. 6-8. *Convolutispora formosana* (Fig. 6. YPT-1 3794.07m-(2), 99:23-16; Fig. 7. YPT-1 3794.07m-(2), 99:22-15; Fig. 8. YPT-1 3794.07m-(2), 99:24-17) (Figs. 1-8. x 1550)











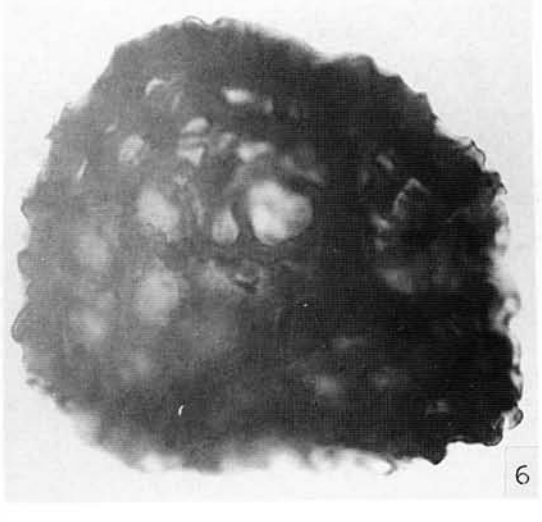
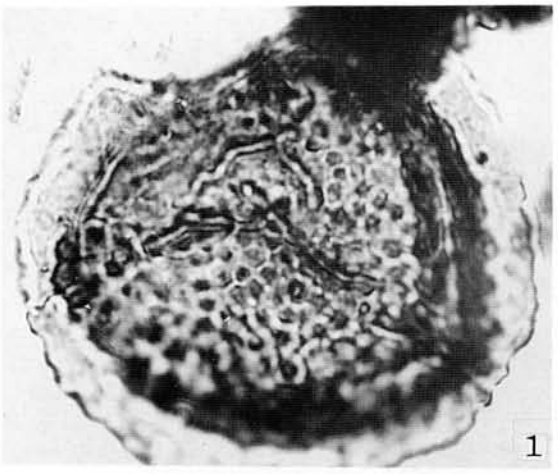
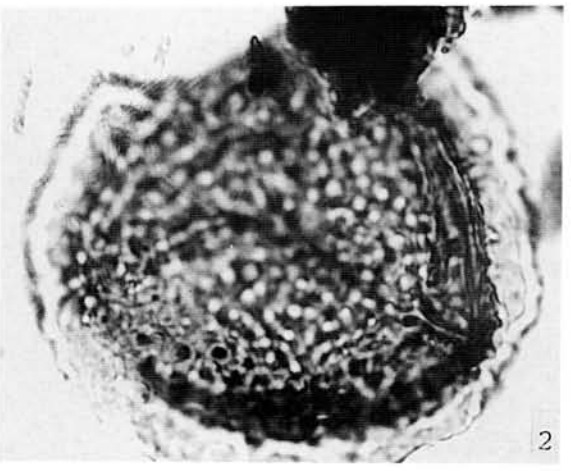
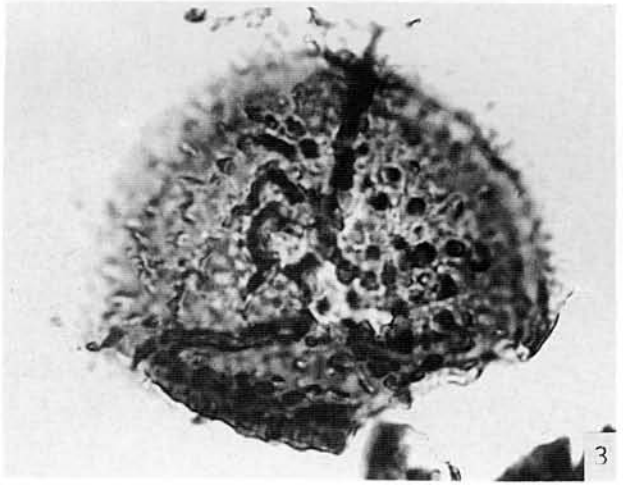
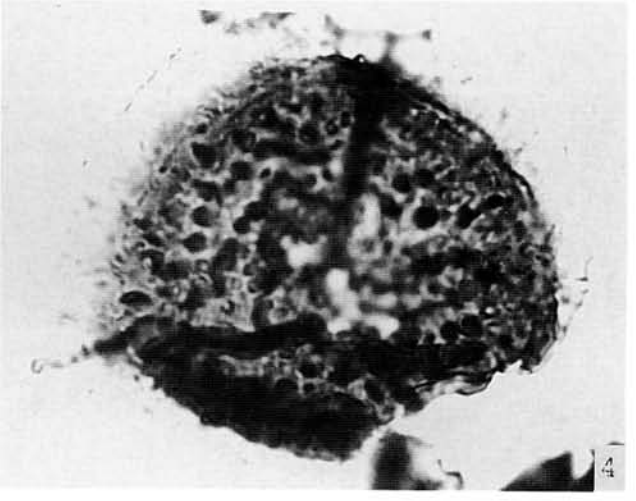


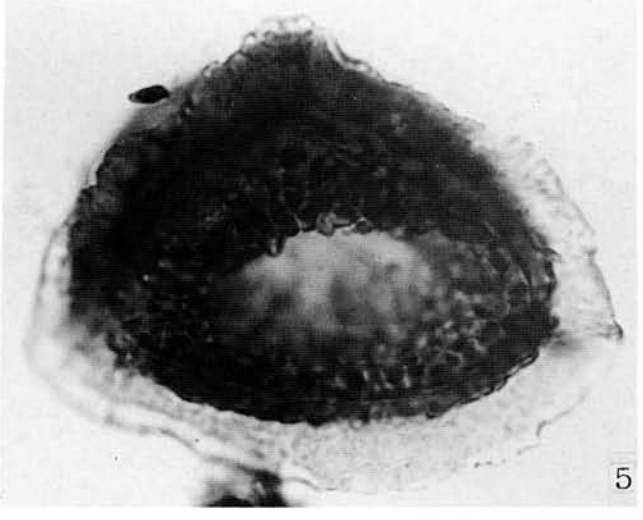
PLATE 25. Figs. 1-4. *Klukisporites taiwanensis* (Fig. 1. YTN-1 3722. 1-3722.3m-(4), 118:24; Fig. 2. YTN-1 3722.1-3722.3m-(4), 118:25; Fig. 3. YTN-1 3722.1-3722.3m-(3), 117:36; Fig. 4. CFVC-4 3722.1-3722.3m-(3) 117:37); Figs. 5-6 *Klukisporites subrotundus* (Fig. 5. YTN-1 3703.50-3703.60m-(1) 115:6-16; Fig.6. YTN-1 3703.50-3703.60m(1), 115:5-15) (Figs. 1-6. x 1550)











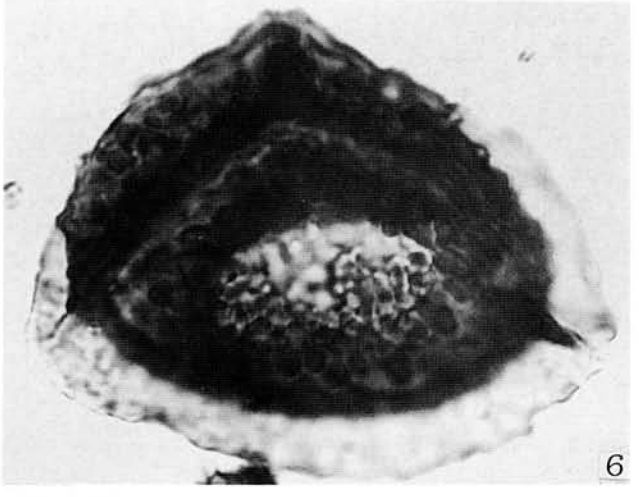
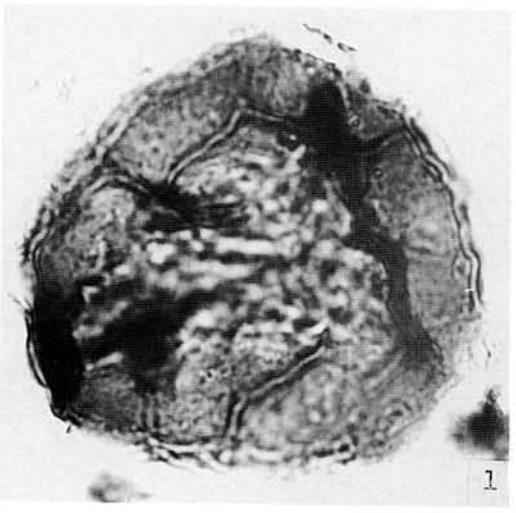
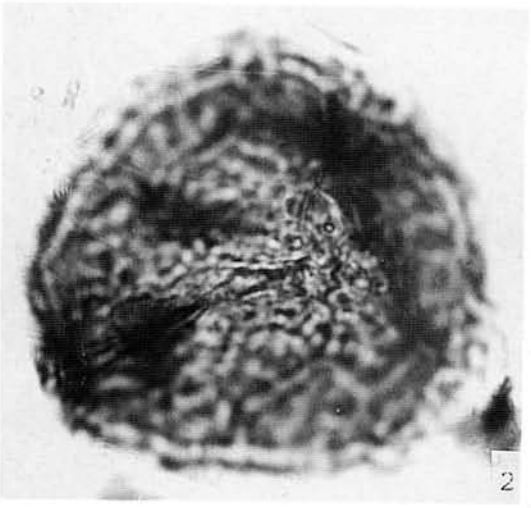
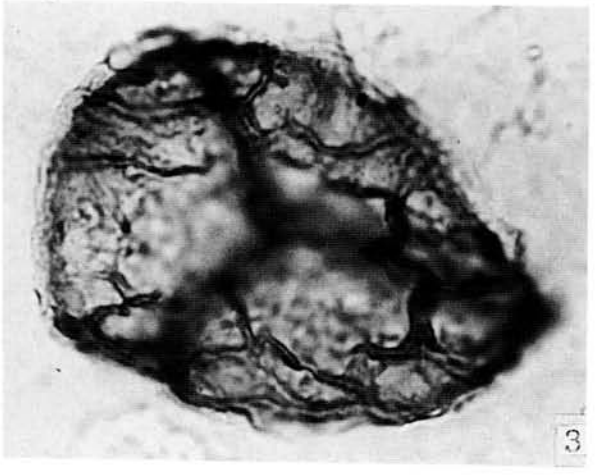
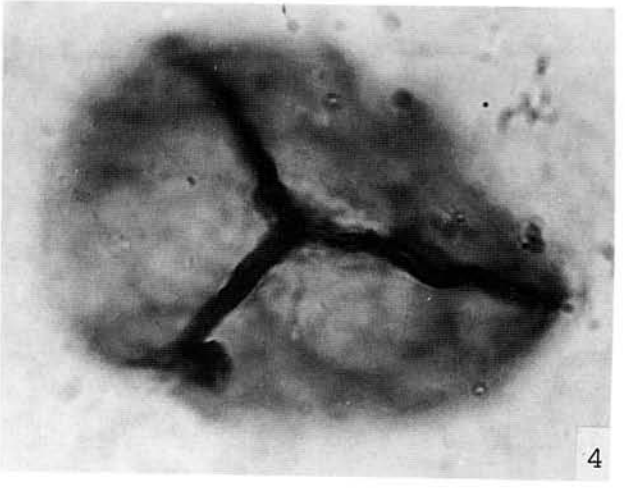


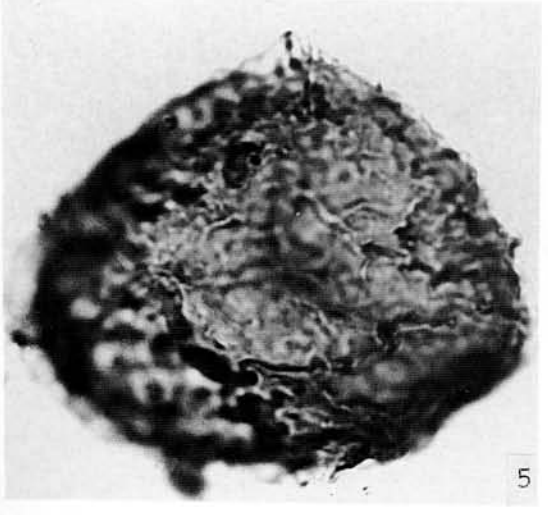
PLATE 26. Figs. 1-4. *Aequitriradites speciosus* (Fig. 1. YTN-1 3711.01m-(4), 86:28A-6; Fig. 2. YTN-1 3711.01m-(4), 86:29A-7; Fig. 3. YTN-1 3722.1-3722.3m-(1),117:11; Fig. 4. YTN-1 3722.1-3722.3m-(1). 117:12); Figs. 5,6. *Aequitriradites speciosus* (Fig. 5. YTN-1 3722.1-3722.3m-(1), 116:33; Fig. 6. YTN-1 3722.1-3722.3m-(1), 116:34) (Figs. 1-6. x 1550)











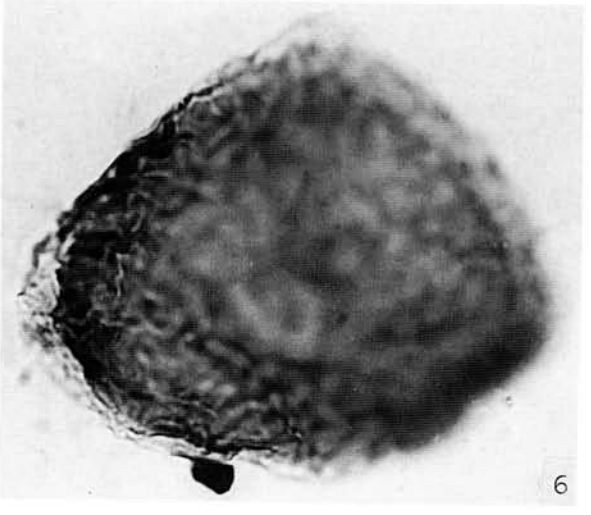
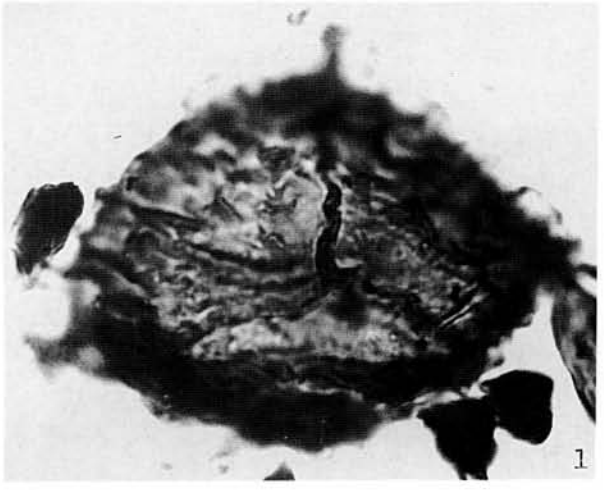
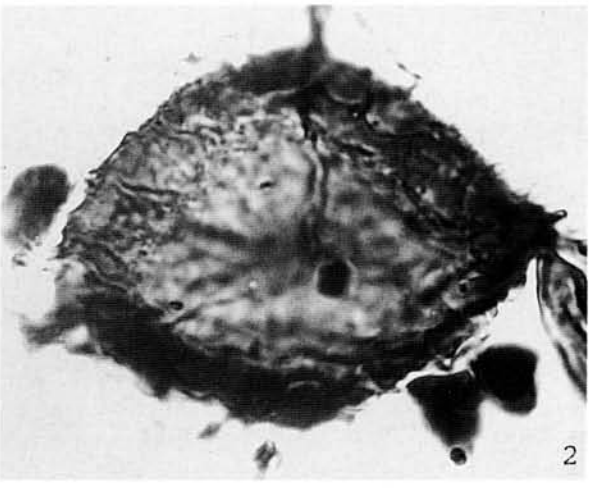
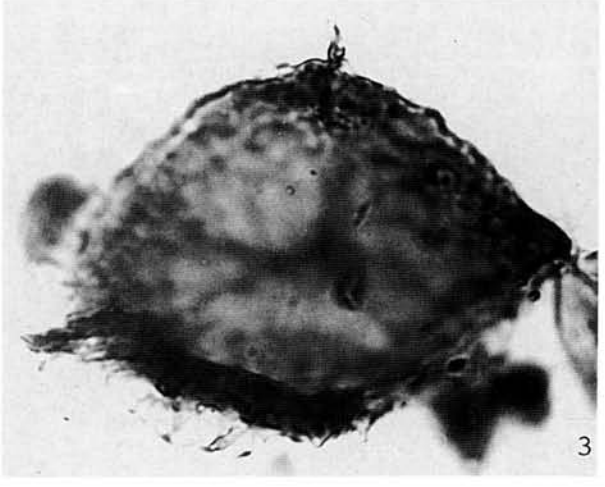
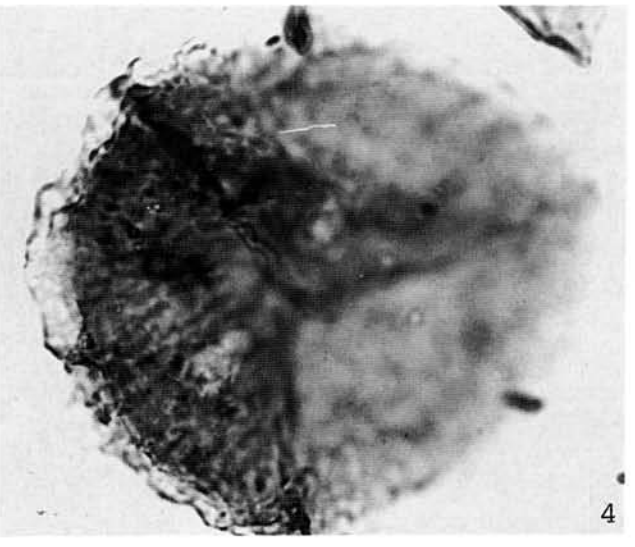


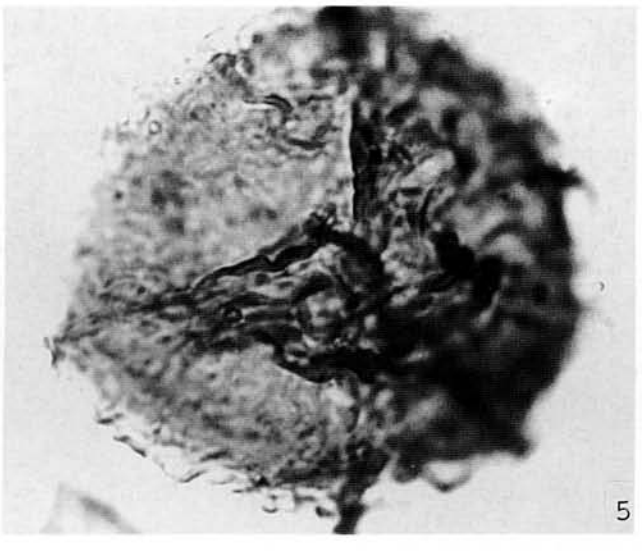
PLATE 27. Figs. 1-4. *Hymenoreticulisporites taiwanensis* (Fig. 1. YTN-1 3711.01m-(4), 86:36A-14; Fig. 2. YTN-1 3711.01m-(4), 86:38A-15; Fig. 3. YTN-1 3722.1-3722.3m-(3), 117:16; Fig. 4. YTN-1 3722.1-3722.3m-(3) 117-17); Figs. 5.6. *Triangulatisporites taiwanensis* (Fig. 5. YTN-1 3722.1-3722.3m-(5), 120:14; Fig. 6. YTN-1 3722.1-3722.3m-(5), 120:13) (Figs. 1-6. x 1550)











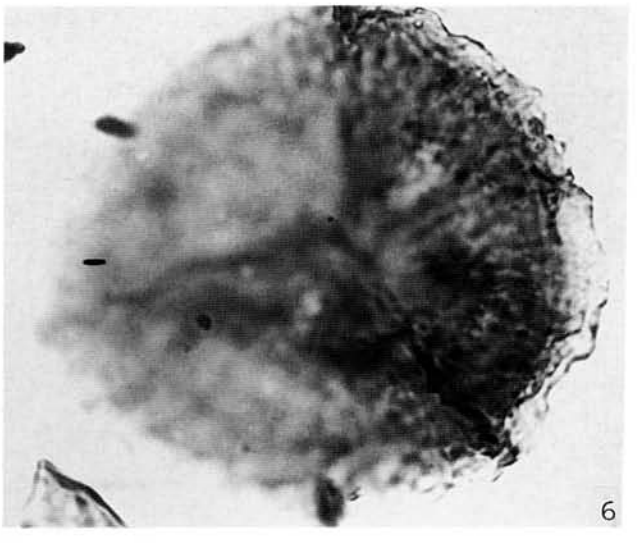
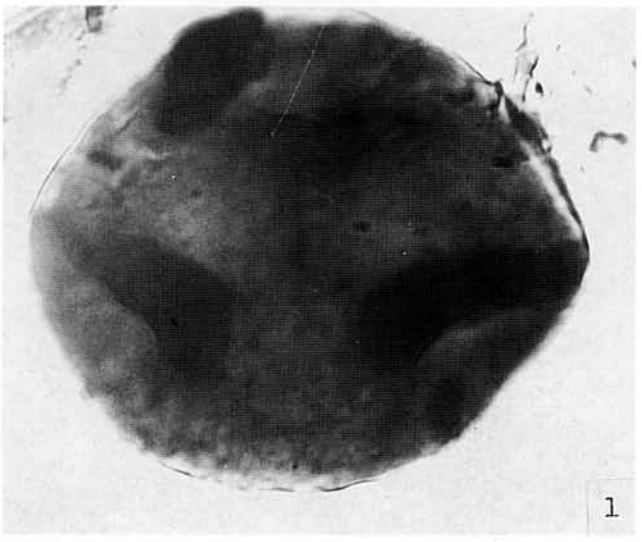
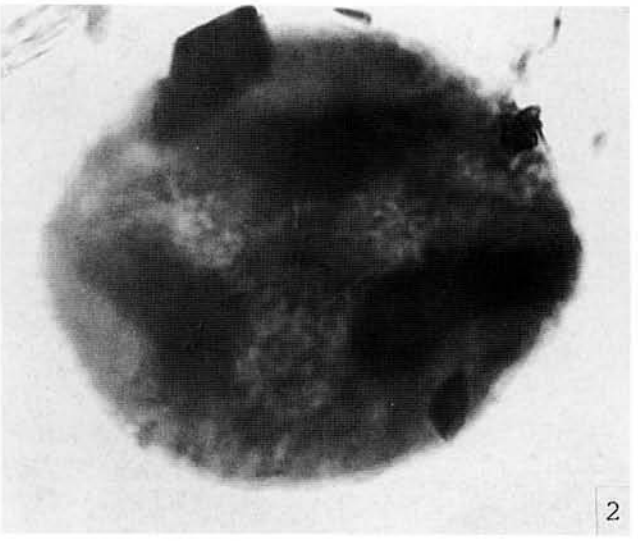
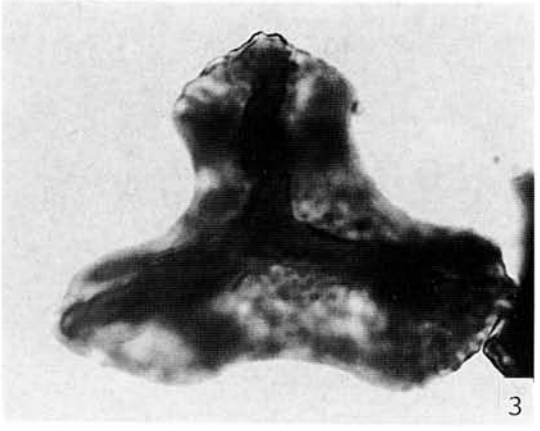
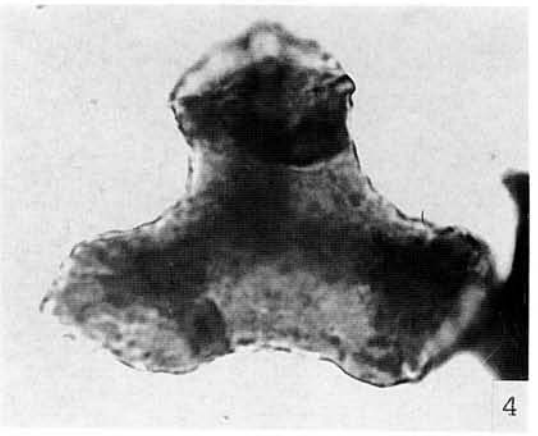


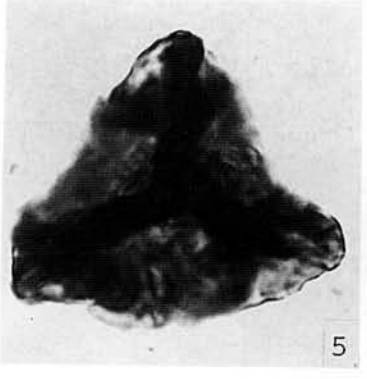
PLATE 28. Figs. 1-6. *Triangulatisporites taiwanensis* (Fig. 1. YTN-1 3722.1-3722.3m-(1), 116:15; Fig. 2. YTN-1 3722. 1-3722.3m-(1), 116-16; Fig. 3. YTN-1 3722.1- 3722.3m-(1), 116:17; Fig. 4. YTN-1 3722.1-3722.3m-(5), 120:2; Fig. 5. YTN-1 3722.1-3722.3m-(5), 120-3; Fig. 6. YTN-1 3722.1-3722.3m-(5), 120:4) (Figs. 1-6. x 1550)

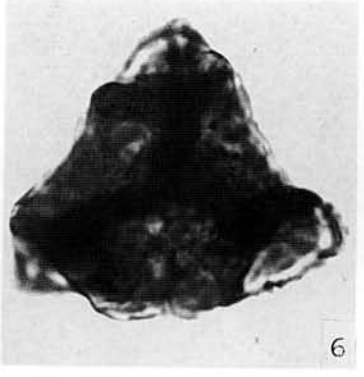












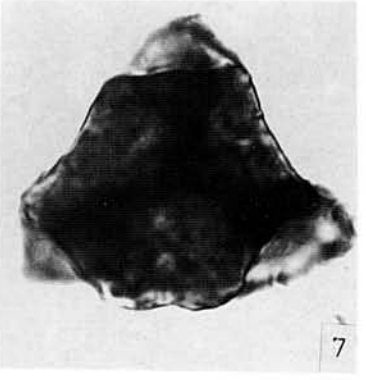


PLATE 29. Figs. 1,2. *Trilobosporites rotundus* (Fig. 1. YTN-1 3722.1-3722.3m-(7), 122:4; Fig. 2. YTN-1 3722.1-3722.3m-(7), 122:3); Figs. 3,4. *Trilobosporites formosensis* (Fig. 3. YTN-1 3722.1-3722.3m-(5), 120:36; Fig. 4. YTN-1 3722.1-3722.3m-(5),120:35); Figs. 5-7. *Trilobosporites deltoidus* (Fig. 5. YTN-1 3718.03m-(2), 121:16; Fig. 6. YTN-1 3718.03m-(2), 121:17; Fig. 7. YTN-1 3718.03m-(2), 121:18) (Figs. 1-7. x 1550)

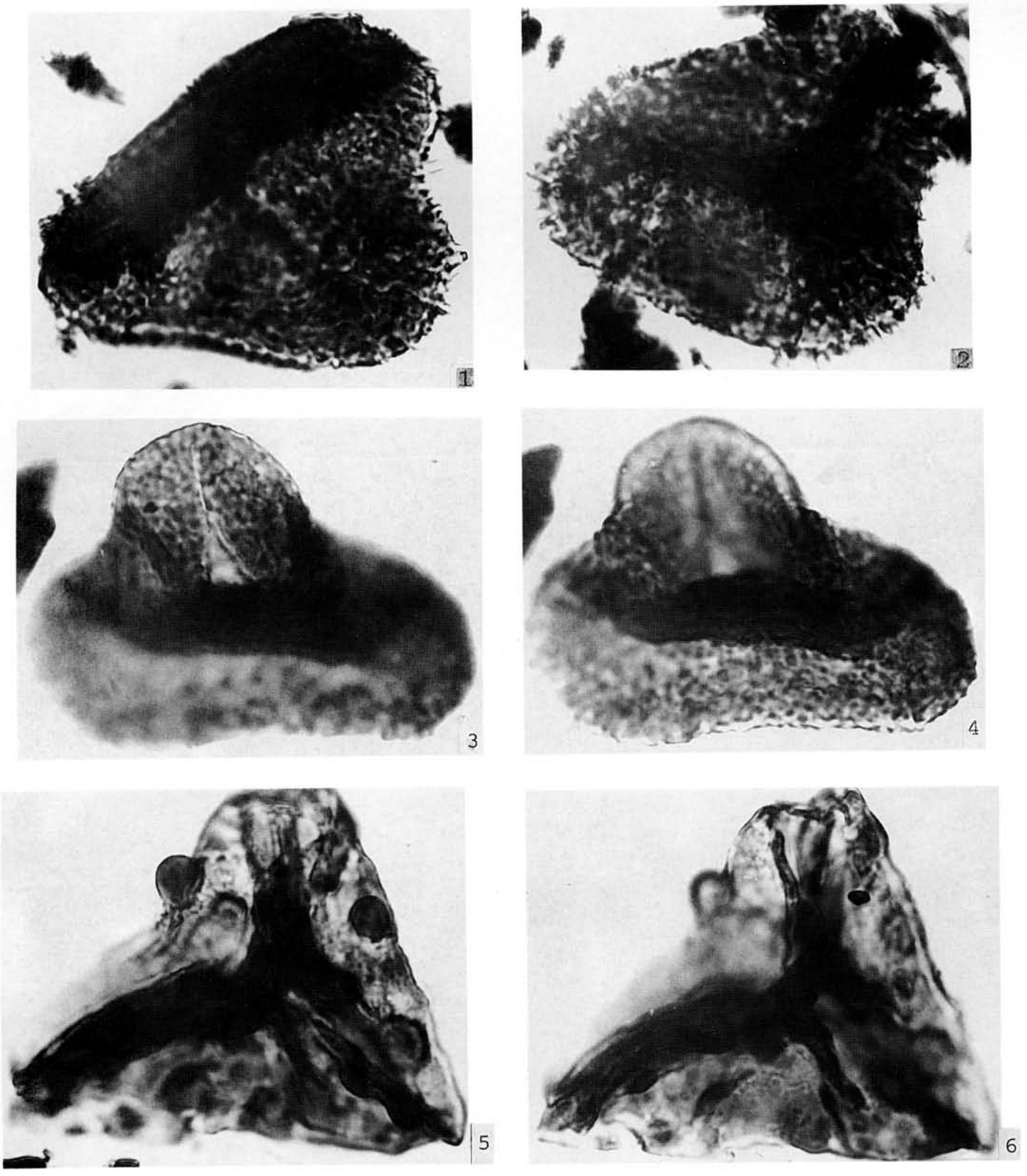
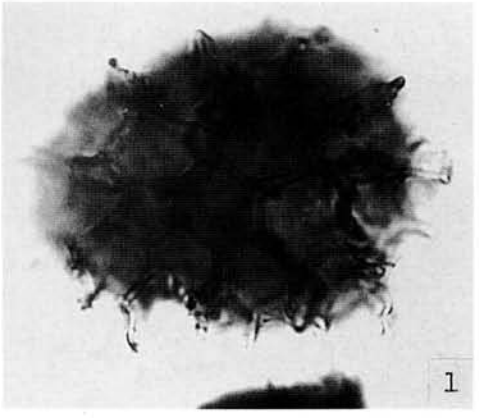
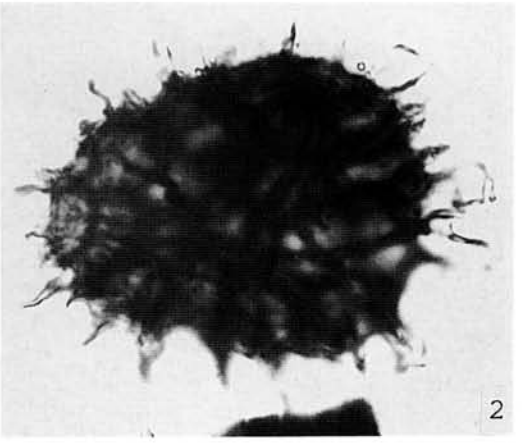
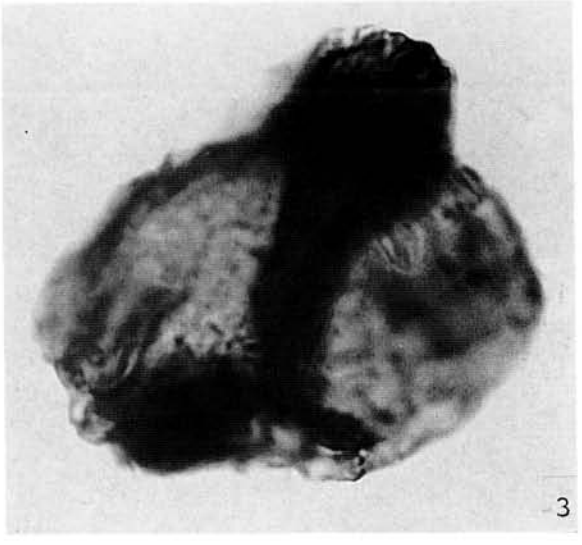
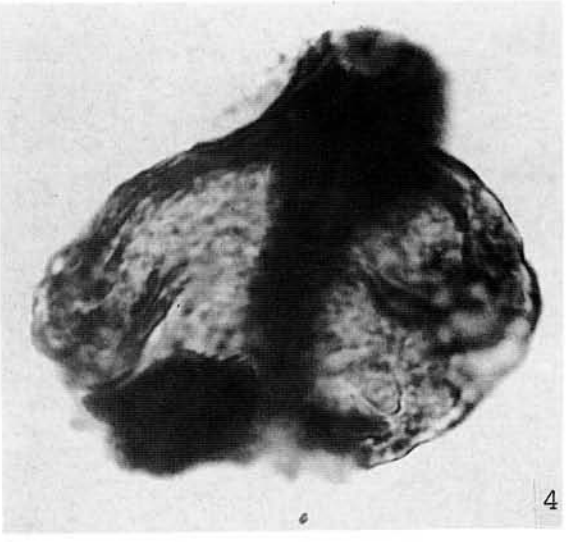


PLATE 30. Figs. 1,2. *Pilosisporites parvus* (Fig. 1. YTN-1 3711.01m-(9), 87: 28A; Fig. 2. YTN-1 3711.01m-(9), 87:25A); Figs. 3,4. *Concavissimisporites taiwanensis* (Fig. 3. YTN-1 3722. 1-3722.3m-(5), 120:27; Fig. 4. YTN-1 3722.1-3822.3m-(5), 120-28); Figs. 5,6. *Rarutuberisporites taiwanensis* (Fig. 5. YTN-1 3722.1-3722.3m-(4), 118:20; Fig. 6. YTN-1 3722.1-3722.3m-(4), 118:21) (Figs. 1-6. x 1550)









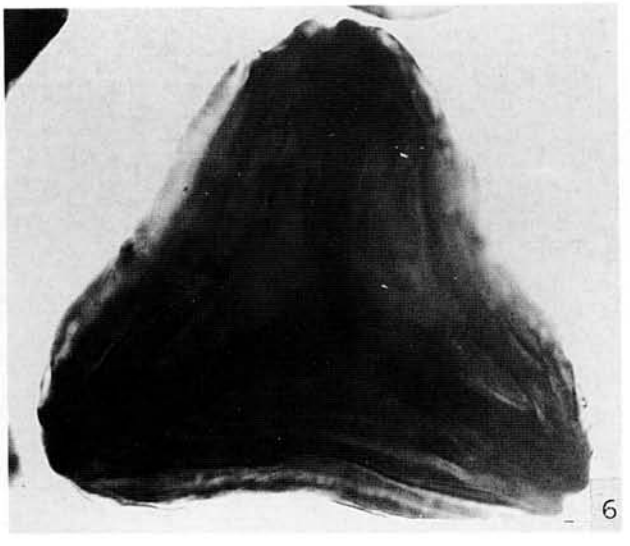
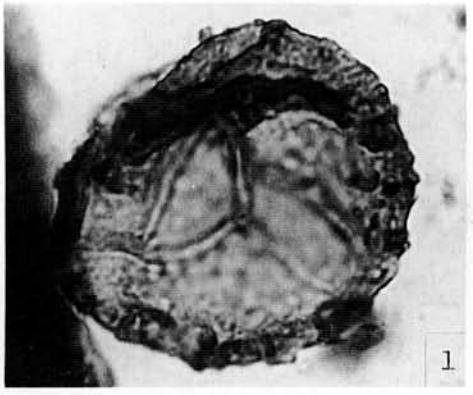
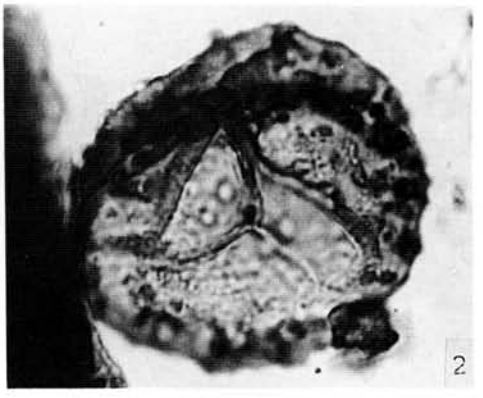
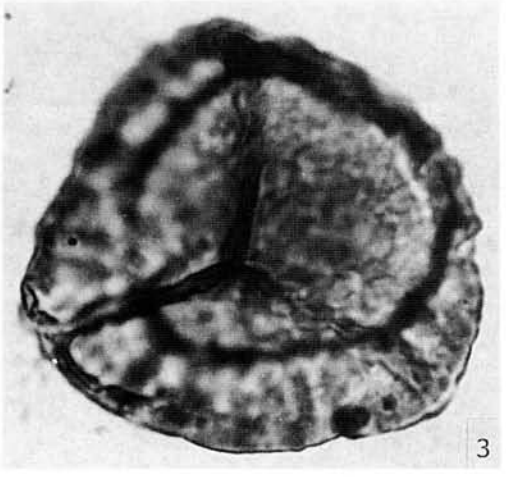
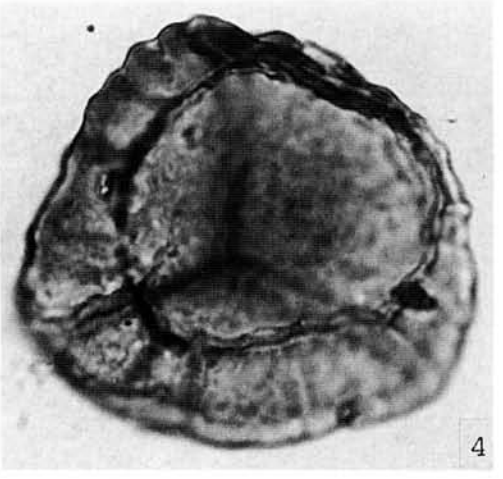


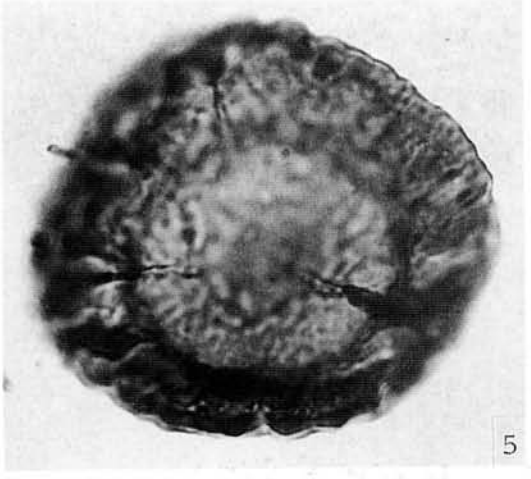
PLATE 31. Figs. 1,2. *Retitriletes cretaceous* (Fig. 1. YTN-1 3722.1-3722.3m-(1), 116:9; Fig. 2. YTN-1 3722.1-3722.3m-(1), 116:10); Figs. 3,4. *Praemerosisporites taiwanensis* (Fig. 3. YTN-1 3722.1-3722.3m-(5), 120:34; Fig. 4. YTN-1 3722.1-3722.3m-(5), 120:33); Figs. 5,6. *Cicatricosisporites mundulus* (Fig. 5. YTN-1 3722.1-3722.3m-(1) 115:17-27; Fig. 6. YTN-1 3722.1-3722.3m-(1), 115:18-28) (Figs. 1-6. x 1550)











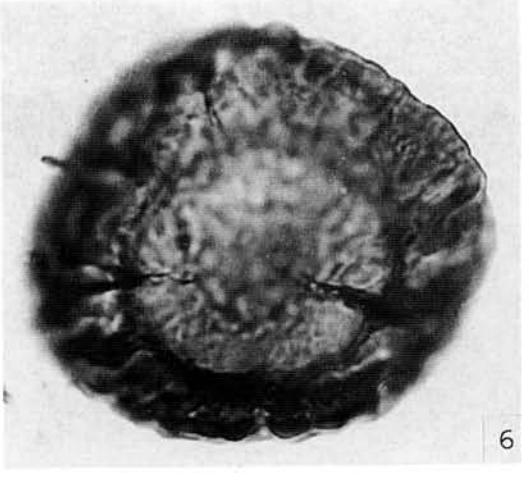
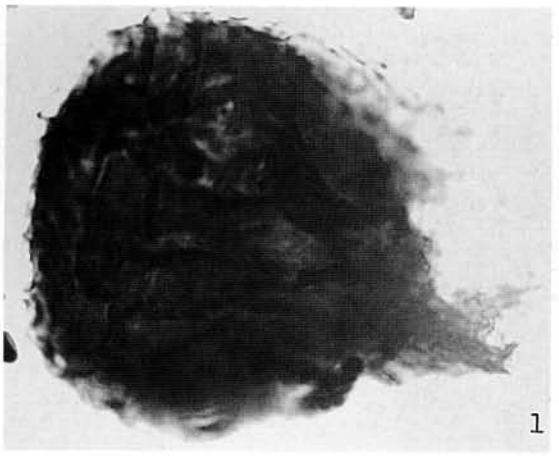
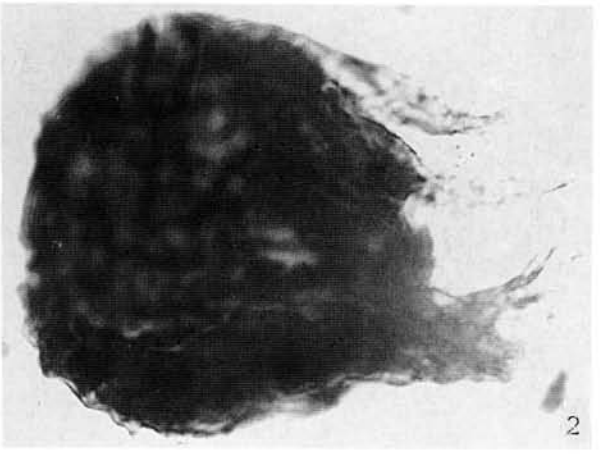
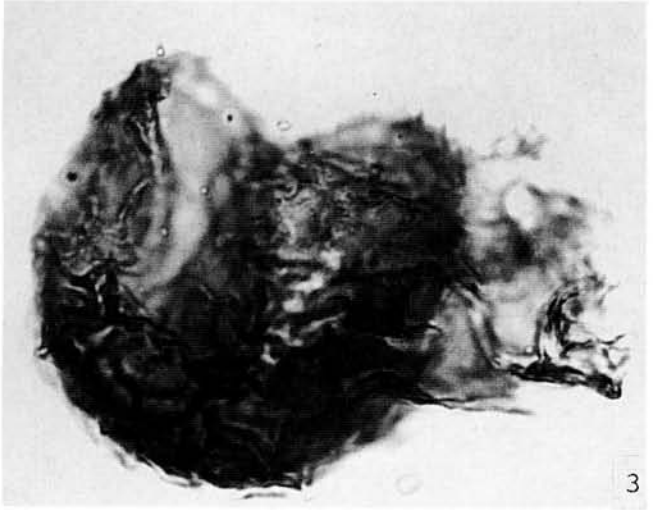
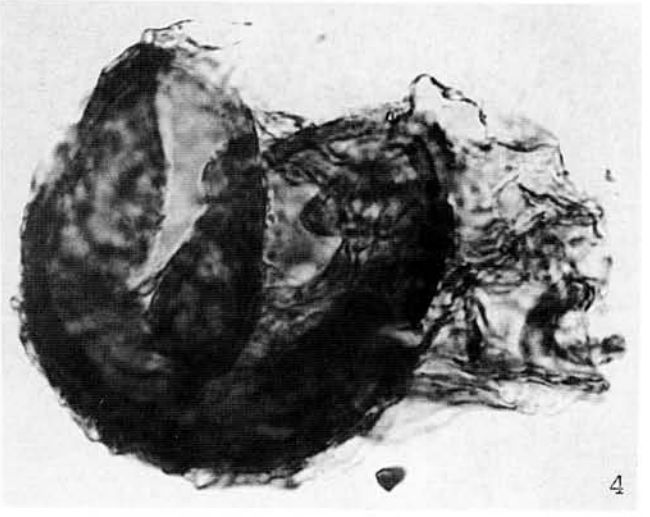


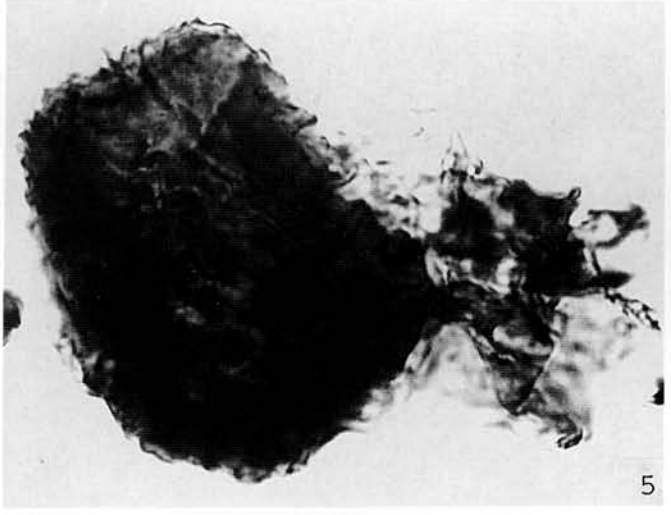
PLATE 32. Figs. 1-6. *Staplinisporites taiwanensis* (Fig. 1. YTN-1 3722.1-3722.3m-(1) 116:6; Fig. 2. YTN-1 3722.1-3722.3m(1), 116:5; Fig. 3. YTN-1 3722.1-3722.3m-(3), 117:27; Fig. 4. YTN-1 3722.1-3722.3m-(3), 117:28; Fig. 5. YTN-1 3722.1-3722. 3m-(1), 116:4; Fig. 6. YTN-1 3722.1-3722.3m-(1), 116:3) (Figs. 1-6. x 1550)











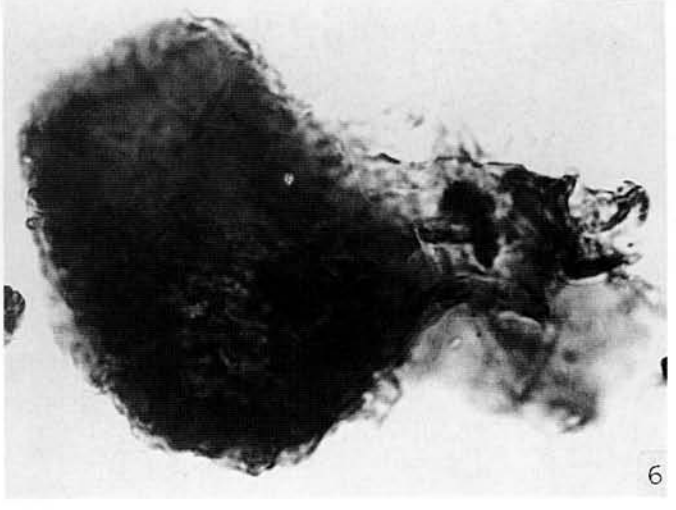
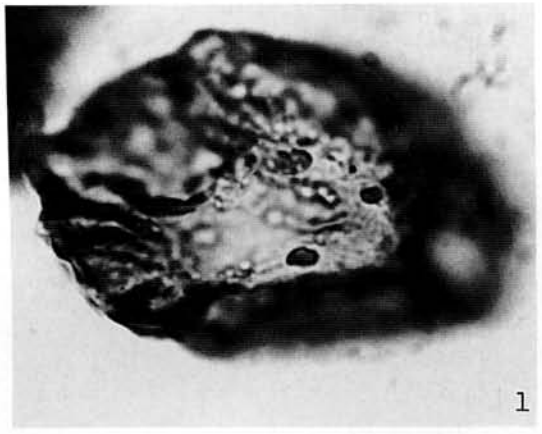
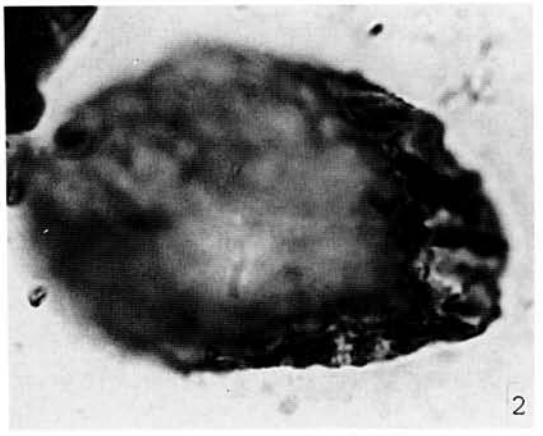
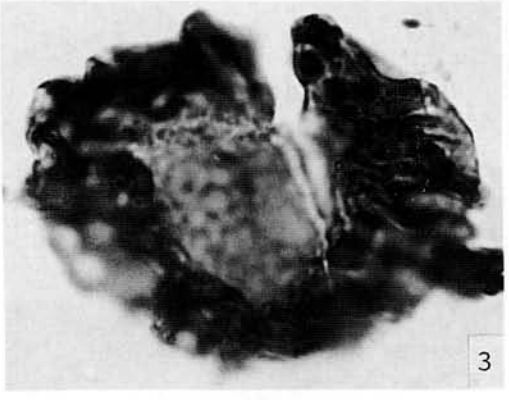
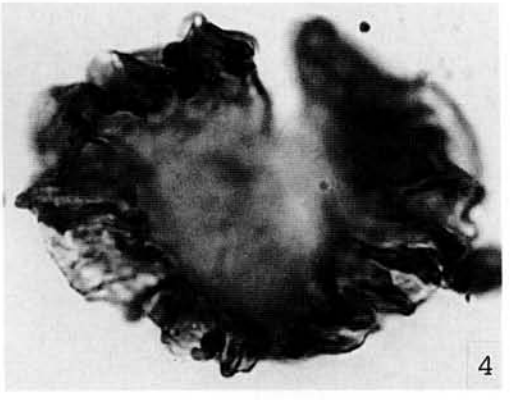


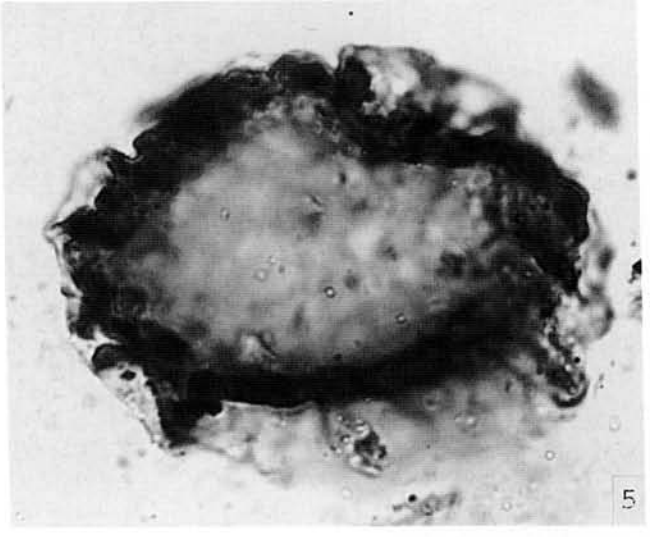
PLATE 33. Figs. 1-6. *Crybelosporites taiwanensis* (Fig. 1. CFC-1D 3797.26m-(1), 94:25A; Fig. 2. YPT-1 3797.26m-(1), 94:26A; Fig. 3. YTN-1 3722.1-3722.3m-(1) 116:1; Fig. 4. YTN-1 3722.1-3722.3m-(1), 116:2; Fig. 5. YTN-1 3722.1-3722.3m-(1), 115:24-34; Fig. 6. YTN-1 3722.1-3722.3m-(1), 115:23-33) (Figs. 1-6. x 1550)











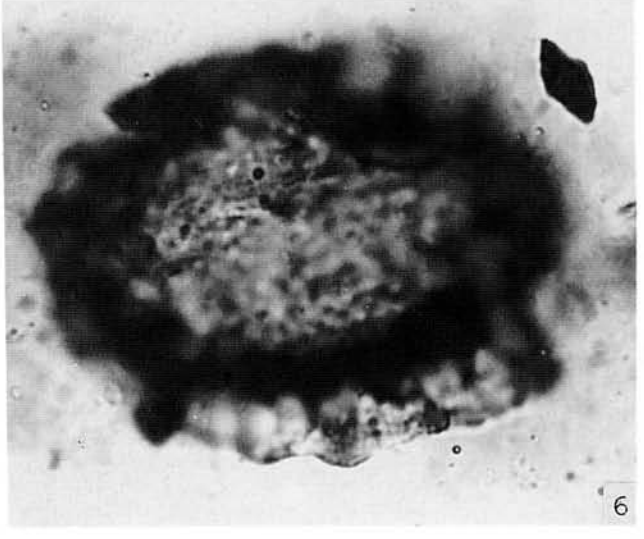
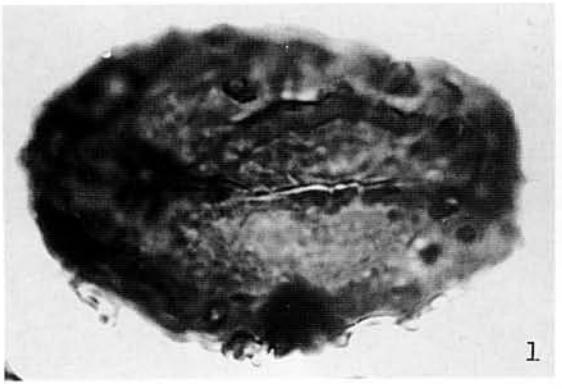
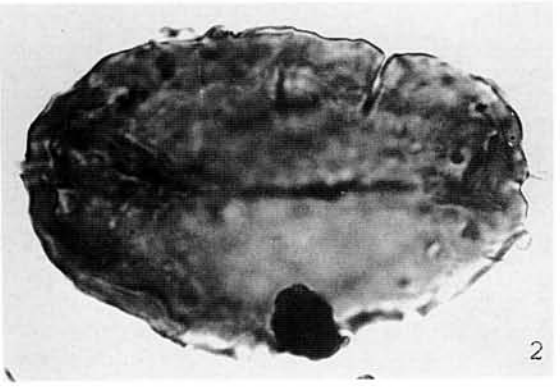
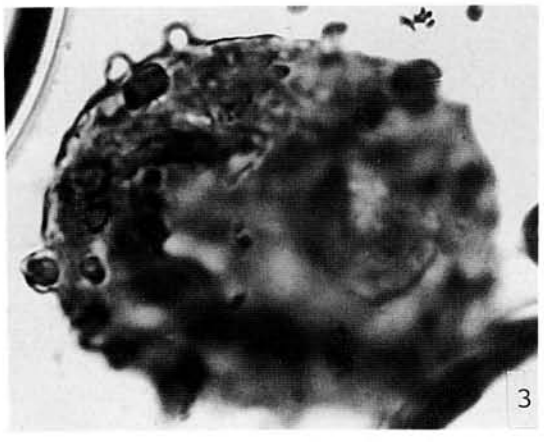
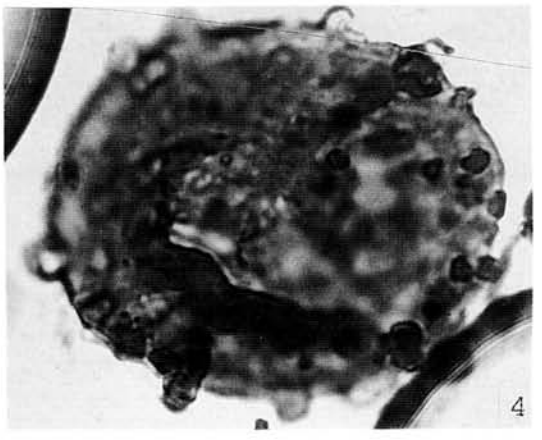


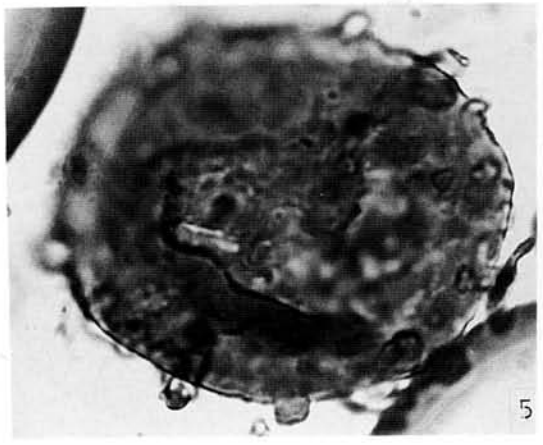
PLATE 34. Figs. 1-6. *Callialasporites taiwanensis* (Fig. 1. YTN-1 3722.1-3722.3m-(4), 118:27; Fig. 2. YTN-1 3722.1-3722.3m-(4) 118:26; Fig. 3. YTN-1 3722.1-3722.3m-(1), 116:27; Fig. 4. YTN-1 3722.1-3722.3m-(1), 116:26; Fig. 5. YTN-1 3722.1-3722.3m-(7), 121:33; Fig. 6. YTN-1 3722.1-3722.3m-(7), 121:34) (Figs. 1-6. x 1550)











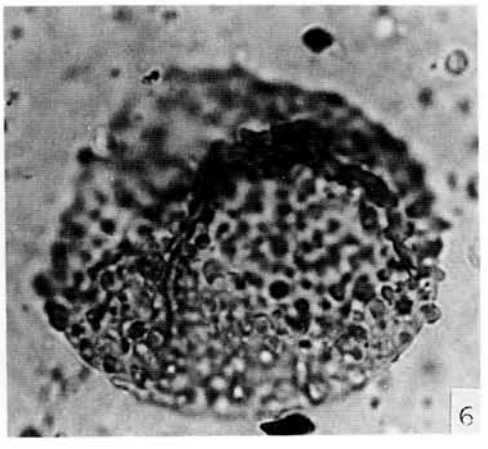
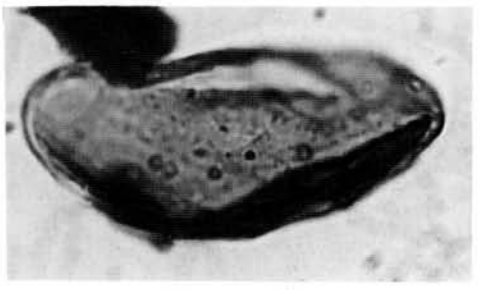


PLATE 35. Figs. 1-5. *Camerosporis tuberosus* (Fig. 1. YTN-1 3722.1-3722.3m-(1), 116:1; Fig. 2. YTN-1 3722.1-3722.3m-(1), 116:0; Fig. 3. YTN-1 3722.1-3722.3m-(1), 115:14-24; Fig. 4. YTN-1 3722.1-3722.3m-(1), 115:16-26); Fig. 5. YTN-1 3722.1-3722.3m-(1), 115:15-25; Figs. 6. *Camerosporites formosus* (YTN-1 3722.1-3722.3m-(1), 115: 22-32) (Figs. 1-6. x 1550)

PLATE 36. Figs. 1-3. *Laevigatosporites gracilis* (Fig. 1. YPT-1 3794.07-(1), 91:16-13; Fig. 2. YPT-1 3794.07m-(1) 91:17-14; Fig. 3. YPT-1 3794.07m-(2), 92:37); Figs. 4,5. *L. gracilis* (Fig. 4. YPT-1 3794.07m-(1), 99:15-8; Fig. 5. YPT-1 3794.07m-(3), 93:23-21); Figs. 6-9. *L. minor* (Fig. 6.YPT-1 3794.07m-(3), 98:22; Fig. 7. YPT-1 3794.07m-(3), 98:23; Fig. 8. YPT-1 3794.07m-(1), 99: 20-13; Fig. 9. YPT-1 3794.07m-(1) 99:21-14); Figs.10-12. *Triplanosporites minor* (Fig. 10. YPT-1 3794.07m-(3), 93:21-19; Fig. 11. YPT-1 3794.07m-(3), 93:18-16; Fig. 12. YPT-1 3794.07m-(3), 93:13-11) (Figs. 1-12. x 1550)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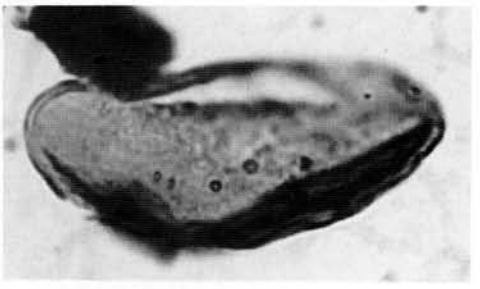
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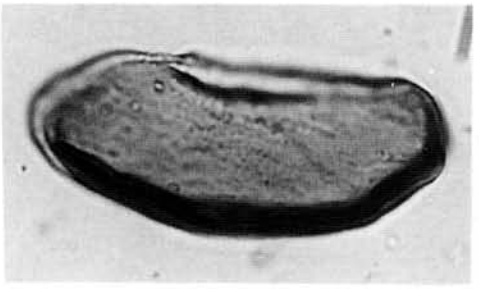
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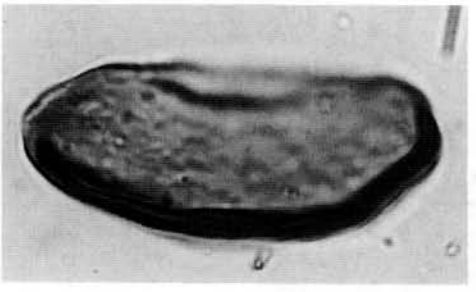
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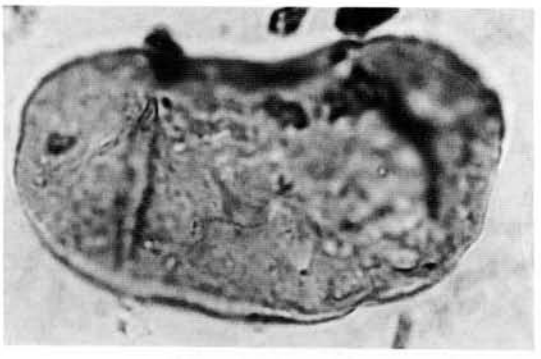
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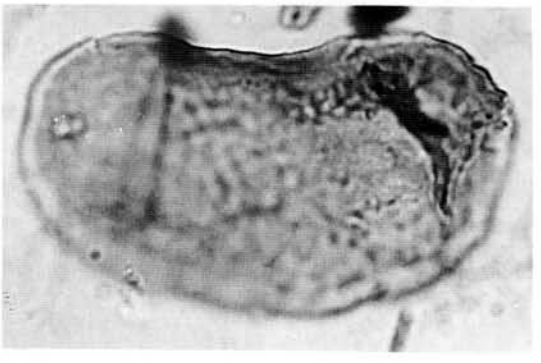
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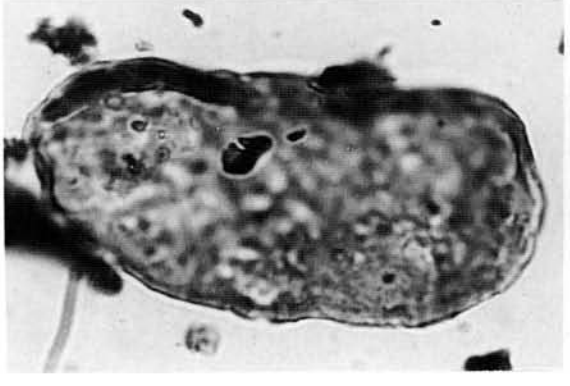
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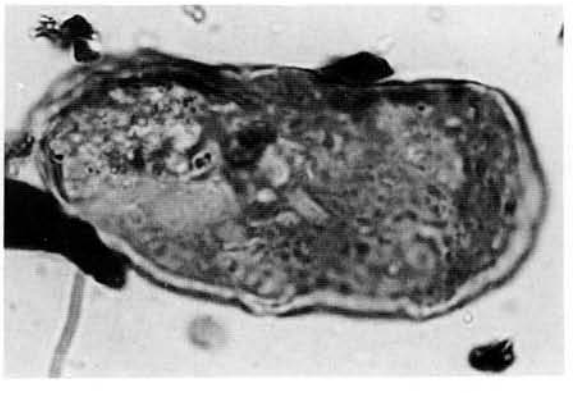
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PLATE 37. Figs. 1-4. *Laevigatosporites nudum* (Fig. 1.YPT-1 3794.07m-(3), 93:17-14; Fig. 2. YPT-1 3794.07m-(3), 93:16-13; Fig. 3. YPT-1 3794.07m-(3), 97:36-29; Fig. 4. YPT-1 3794.07m-(3) 98: 35-28); Figs. 5-8. *L. sinensis* (Fig. 5. YPT-1 3786.37m-(4), 92:31-29; Fig. 6. YPT-1 3786.37m-(4), 92:30-28; Fig. 7. YPT-1 3790.48m-(4), 98:17-10; Fig. 8. YPT-1 3790.48m-(4), 98:18-11) (Figs. 1-8. x 1550)

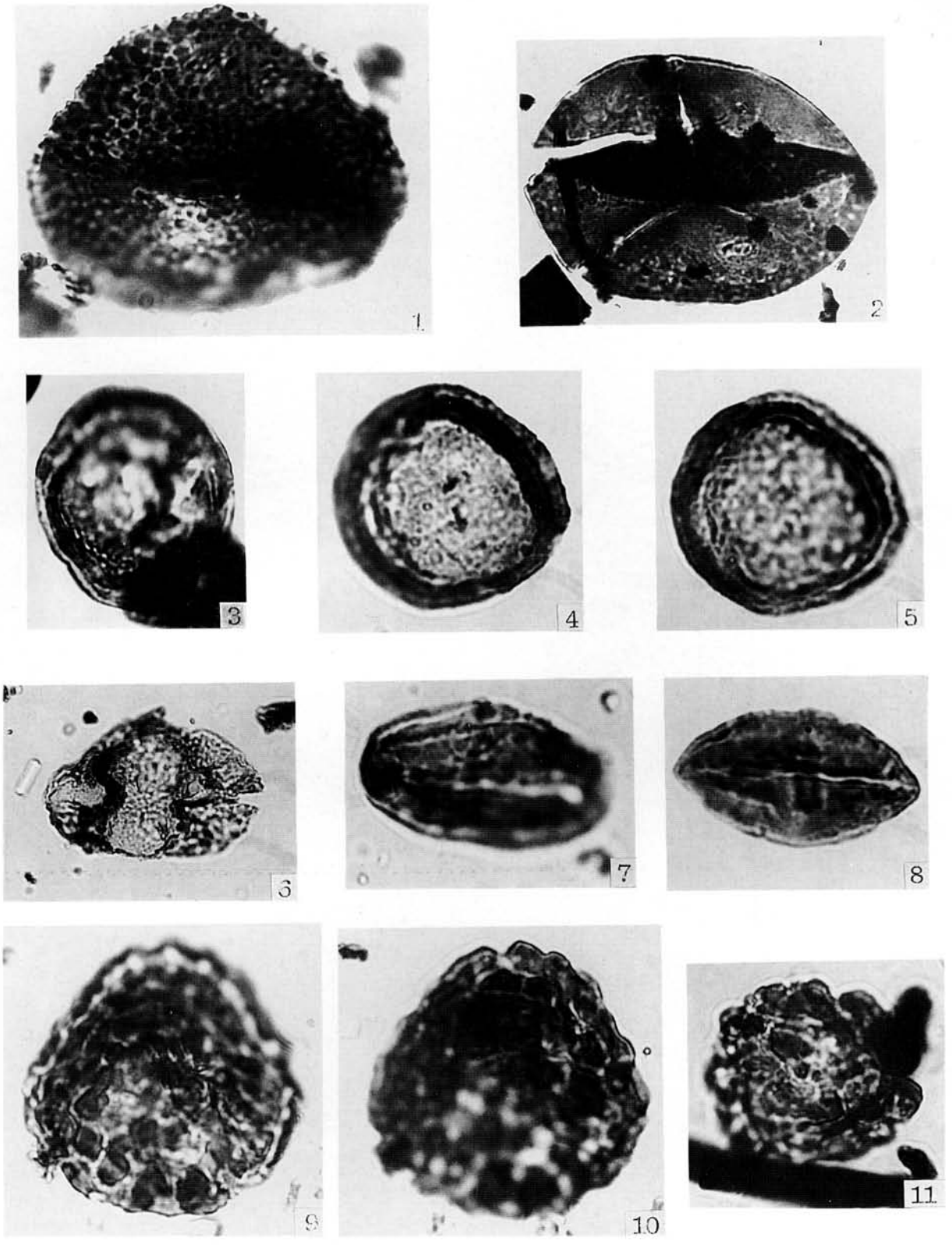
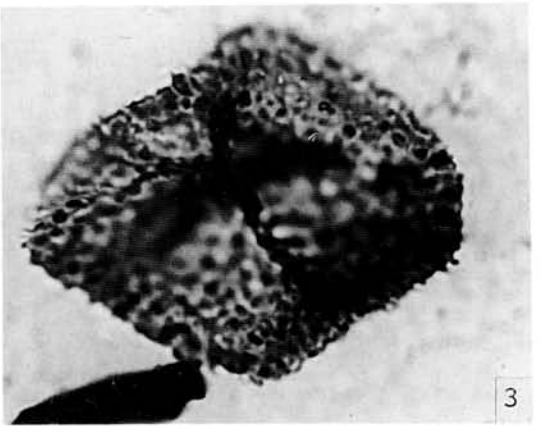
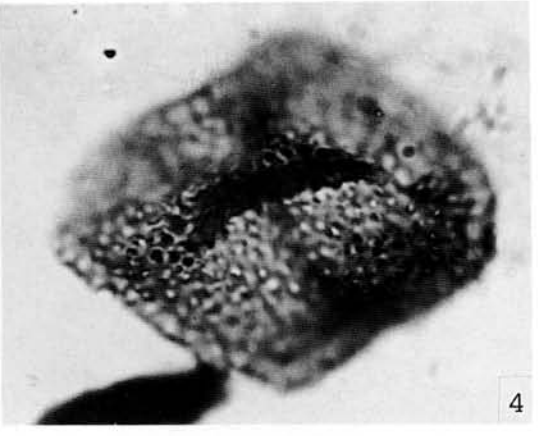


PLATE 38. Fig. 1. *Verrucosisporites cretaceous* (YTN-1 3702,54m-(1), 85:27-4); Fig. 2. *Biretisporites magnus* (YTN-1 3711.01m-(1), 85:16-37); Figs. 3-5. *Classopollis annulatus* (Fig. 3. YTN-1 3702.75m-(4),84: 38-15; Fig. 4. YTN-1 3711.01m-(10), 87:10A-32; Fig. 5. YTN-1 3711.01m-(10), 87:11A-33); Fig. 6. *Pityosporites longicorpus* (YTN-1 3711.01m-(6), 86:7A-30); Fig. 7. *Tricolpopollenites mundulus* (YTN-1 3711.01m-(7), 87:30A-7); Fig. 8. *Cycadopites lanceolatus* var. *scabratus* (YTN-1 3711.01m-(8),87: 31A-9); Figs. 9-11. *Rubinella taiwaniana* (Fig. 9. YTN-1 3711.01m-(5),86:42A-20; Fig. 10. YTN-1 3711.01m-(5), 86:43A-21; Fig. 11. YTN-1 3711.01m-(7), 86:11A-23) (Figs. 2,6 x 600; figs. 1,3-5,7-11 x1550)





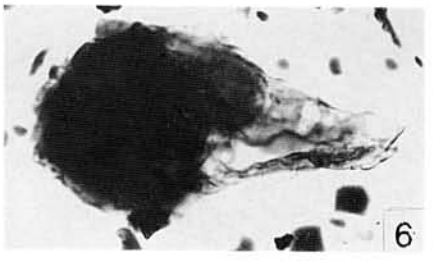
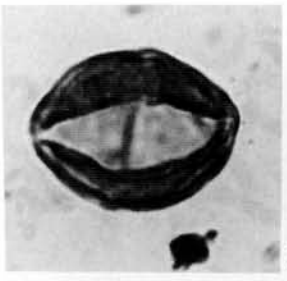


PLATE 39. Figs. 1,2. *Confertisulcites cretaceous* (Fig. YTN-1 3722.1-3722.3m-(2), 117:5; Fig. 2. YTN-1 3722.1-3722.3m-(2), 117:6); Figs. 3,4. *Echinaperturites echinatus* (Fig. 3. YTN-1 3722.1-3722.3m-(4) 118:4; Fig. 4. YTN-1 3722.1-3722.3m-(4), 118:3); Figs. 5,6. *Crybelosporites taiwanensis* (Fig. 5.YTN-1 3797.26m-(3), 95:26-18; Fig. 6. YPT-1 3797.26m-(3), 95:25-17) (Figs. 1-4 x 1550; figs. 5,6 x 600)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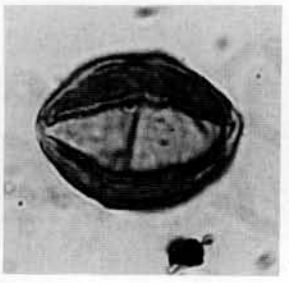
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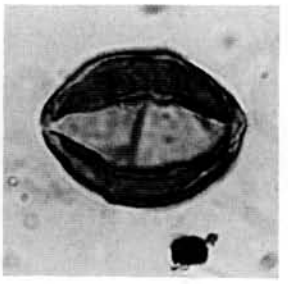
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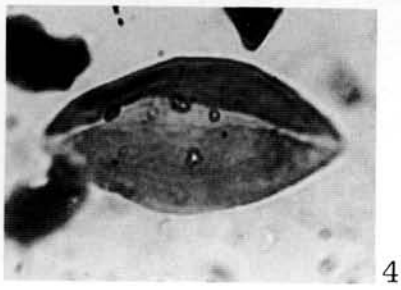
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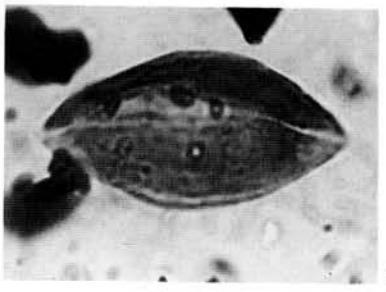
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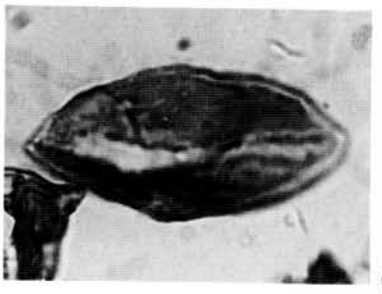
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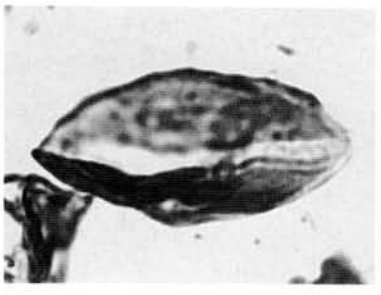
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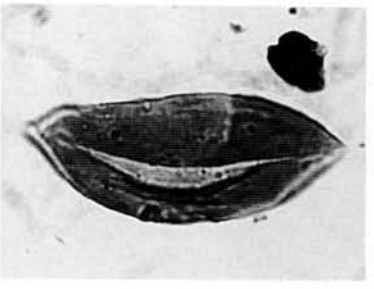
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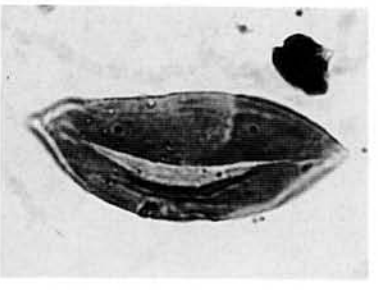
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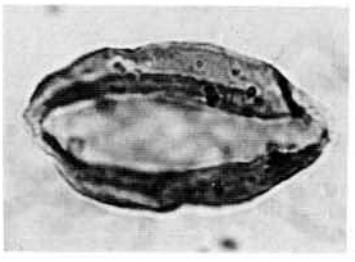
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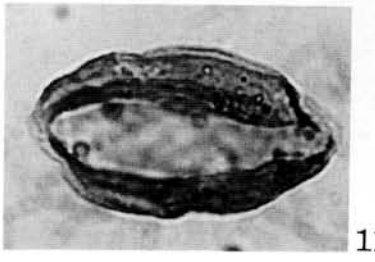
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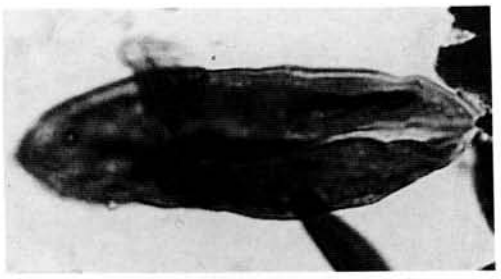
PLATE 40. Figs. 1-3. *Cycadopites ovalis* (Fig. 1. YPT-1 3794.07m-(5), 93:42-40; Fig. 2. YPT-1 3794.07m-(5), 94:10A-2; Fig. 3. YPT-1 3794.07m-(5), 94:9A-1); Figs. 4-9. *C. lanceolatus* (Fig. 4. YPT-1 3794.07m-(5), 93:44-38; Fig. 5. YPT-1 3794.07m-(5), 93:45-39; Fig. 6. YPT-1 3794.07m-(4), 93:32-36; Fig. 7. YPT-1 3794.07m-(4), 94:31-29; Fig. 8. CJF-D 3794.07m-(5), 94:9-4; Fig. 9. YPT-1 3794.07m-(5), 94:8-3); Figs.10-12. *Cycadopites lanceolatus* var. *scabratus* (Fig. 10. YPT-1 3794.07m-(2), 92:10-35; Fig. 11. YPT-1 3794.07m-(2),92:11-34; Fig. 12. YTN-1 3711.01m-(8), 87:31A-9) (Figs. 1-12. x 1550)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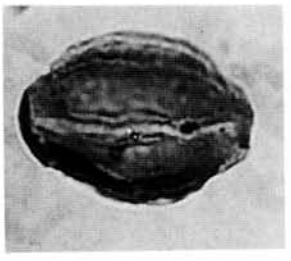
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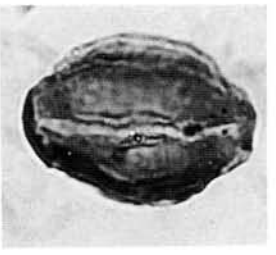
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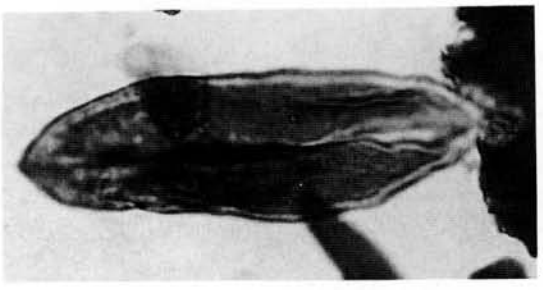
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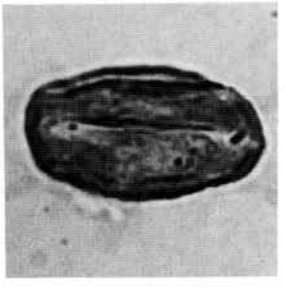
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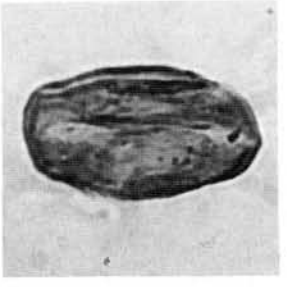
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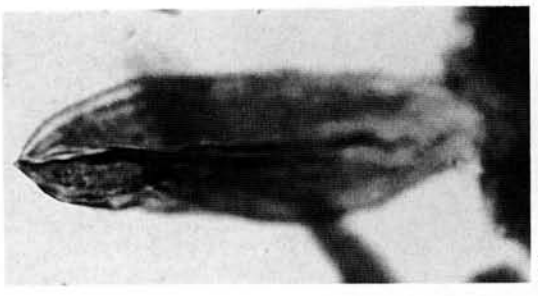
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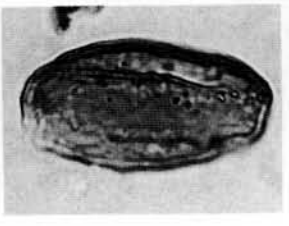
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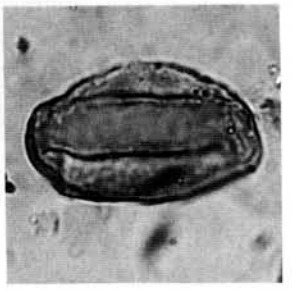
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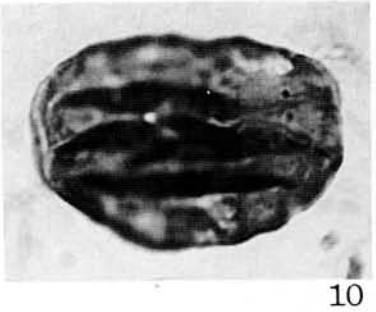
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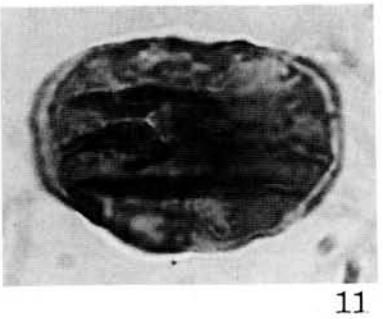
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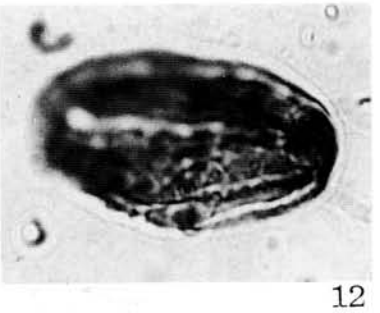
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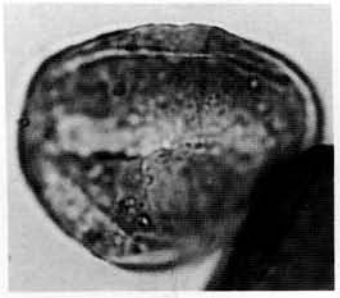
PLATE 41. Figs. 1,3. *Confertisulcites formosus* (Fig. 1. YPT-1 3797.26m-(1),94:31A-23; Fig. 2. YPT-1 3797.26m-(1), 94:29-21; Fig. 3. YPT-1 3797.26m-(1), 94:30-22); Figs. 4,5. *Cycadopites attenuatus* (Fig. 4. YPT-1 3786.37m-(2),92:12; Fig. 5. YPT-1 3786.37m-(2), 92:13); Figs. 6-9. *Tricolpopollenites oblongus* (Fig. 6. YPT-1 3794.07m-(3), 93:19-17; Fig. 7. YPT-1 3794.07m-(3), 93:20-18; Fig. 8. YPT-1 3797.26m-(3), 95:35-27; Fig. 9. YPT-1 3797.26m-(2), 94:17-9); Figs.10-11. *T. medieus* (Fig. 10. YTN-1 3703.56m-(3), 91:26-23; Fig. 11. YTN-1 3703.56m-(3), 91:27-24); Fig. 12. *T. mundulus* (YTN-1 3711.01m-(7), 87:29A-6) (Figs. 1-12. x 1550)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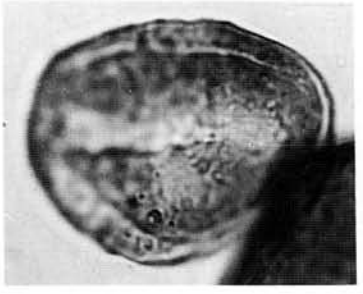
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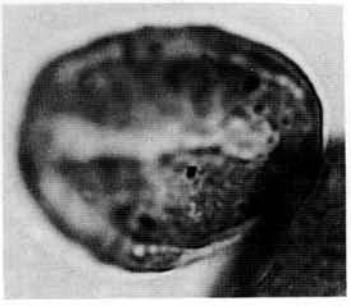
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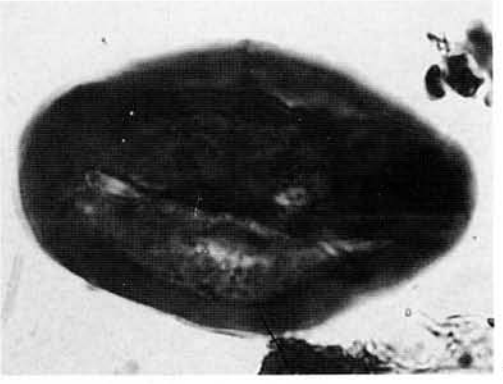
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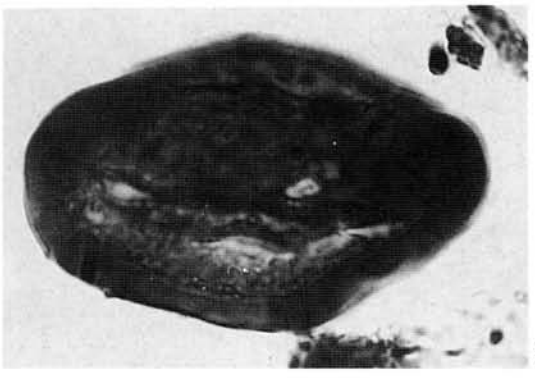
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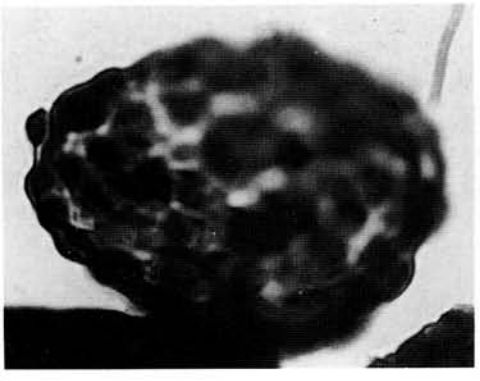
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PLATE 42. Figs. 1-3. *Eucommidites formosus* (Fig. 1. YPT-1 3794.07m-(3), 98: 42A-36; Fig. 2. YPT-1 3794.07m-(3), 98:43A-37; Fig. 3. YPT-1 3794.07m-(3), 98:44A-35); Figs. 4,5. *Tricolpopollenites lepidus* (Fig. 4. YPT-1 3794.07m-(3), 98:45A-39; Fig. 5. YPT-1 3794.07m-(1), 99:8-1); Figs. 6-8. *Canaliculatisporites taiwanensis* (Fig. 6. YPT-1 3794.07m-(2), 99:31-24; Fig. 7. YPT-1 3794.07m-(2), 99:32-25; Fig. 8. YPT-1 3794.07m-(2), 99:33-26) (Figs. 1-8. x 1550)

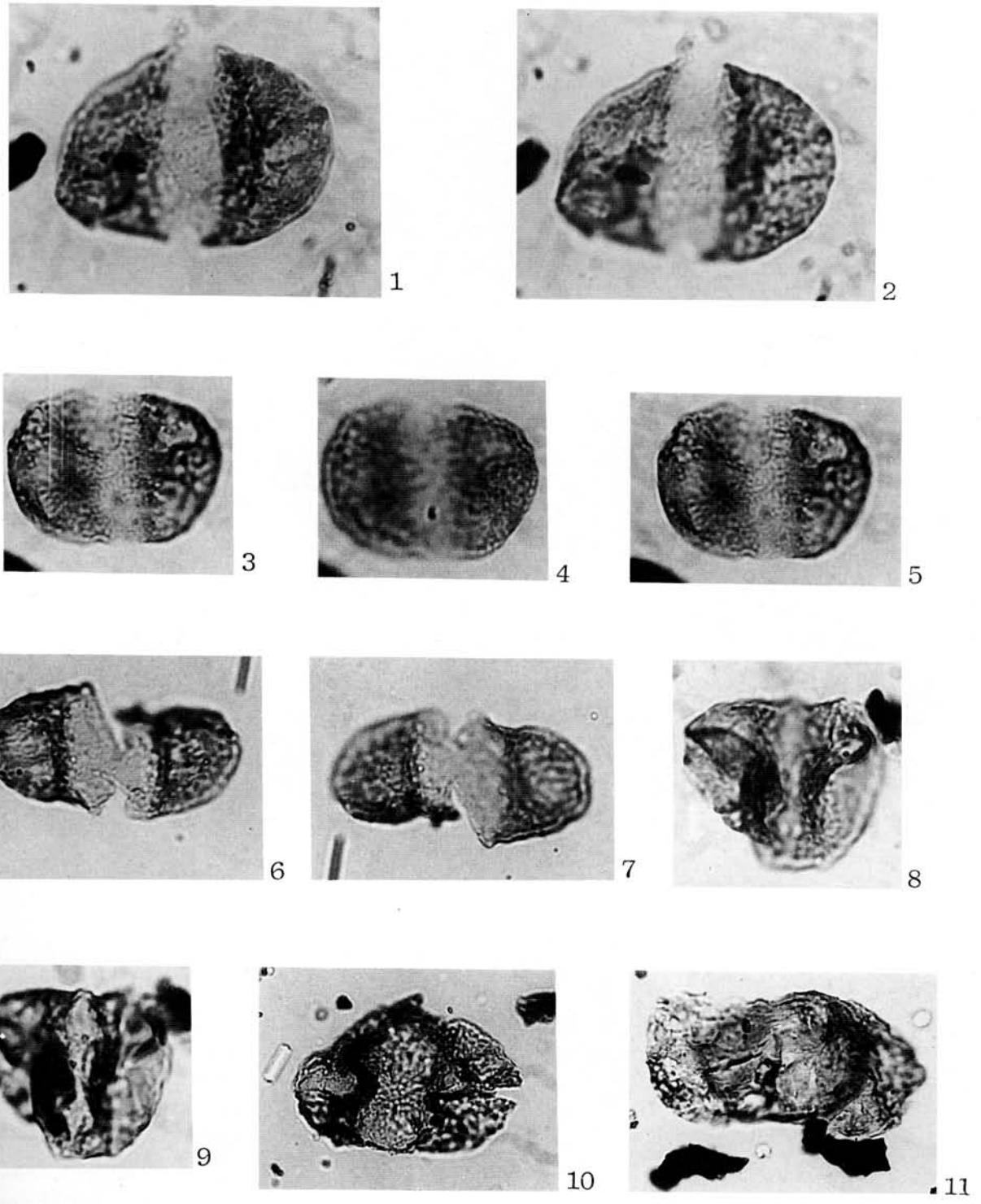
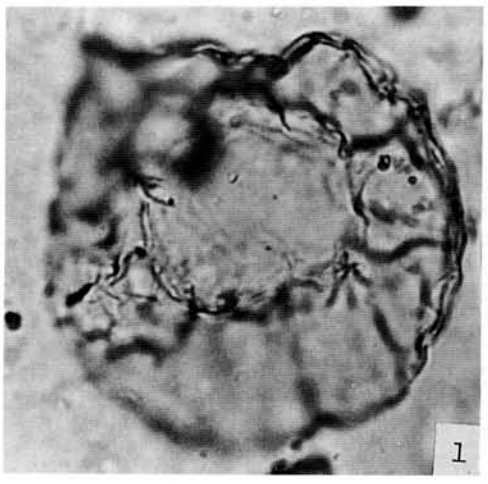
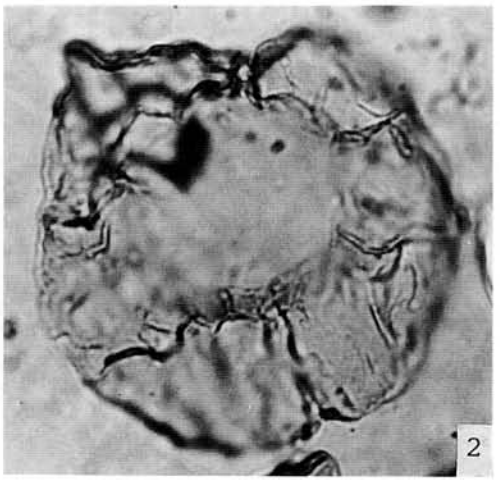
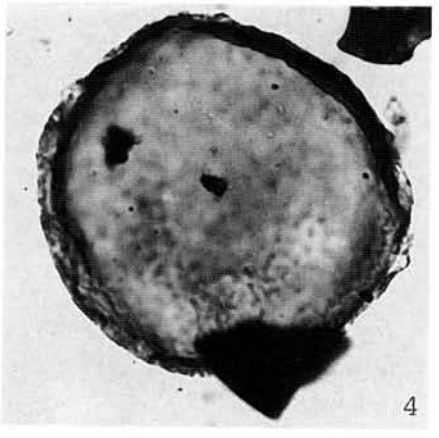
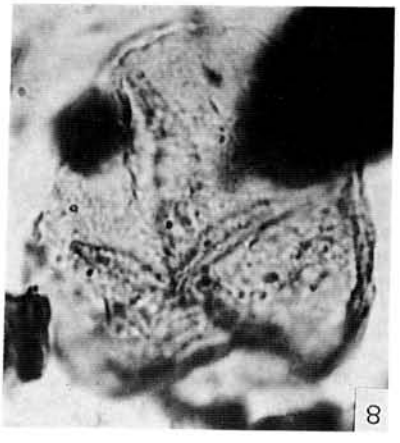


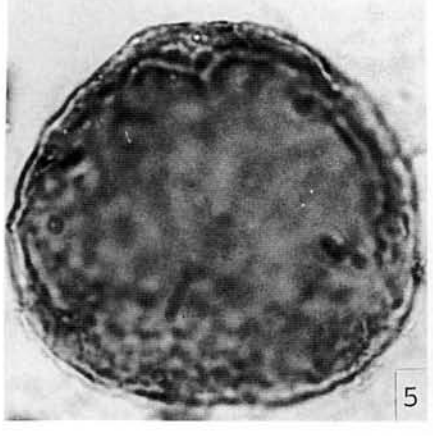
PLATE 43. Figs. 1,2. *Vitreisporites mediocris* (Fig. 1. YPT-1 3794.07m-(4), 93:36-34; Fig. 2. YPT-1 3794.07m-(4), 93:37-35); Figs. 3-9. *Vitreisporites pallidas* (Fig. 3. YPT-1 3794.07m-(3), 93:3-1; Fig. 4. YPT-1 3794.07m-(3), 93:4-2; Fig. 5. YPT-1 3794.07m-(3), 93:5-3; Fig. 6. YPT-1 3794.07m-(3), 98:37A-31; Fig. 7. YPT-1 3794.07m-(3), 97:38A-32; Fig. 8. YPT-1 3786.37m-(2),92:6-4; Fig. 9. YPT-1 3786.37m-(2), 92:7-5); Fig. 10. *Pityosporites longicorpus* (YTN-1 3711.01m-(6), 86:6A-29); Fig. 11. *Pityosporites vulgaris* (YTN-1 3702.75m-(5), 84:41-18) (Figs. 1-9 x1550; figs. 10,11 x 600)

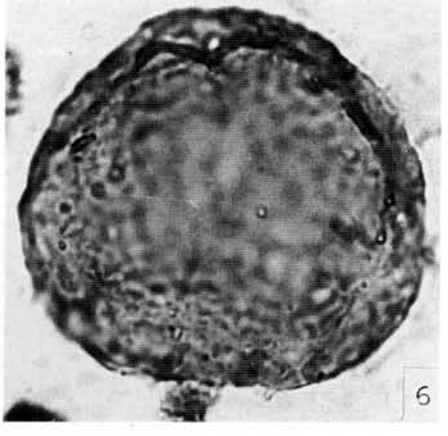












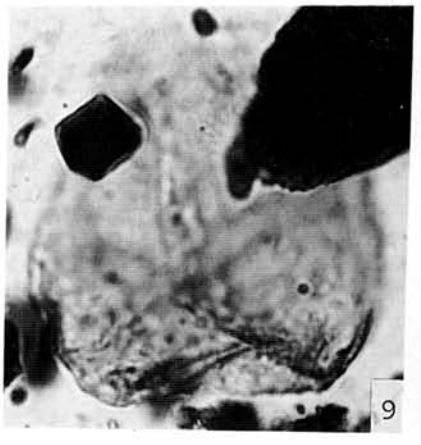


PLATE 44. Figs. 1,2. *Membranospharea rugosa* (Fig. 1. YTN-1 3722.1-3722.3m-(0), 116:22; Fig. 2. YTN-1 3722.1-3722.3m-(0), 116:23); Figs. 3-6. *Araucariacites formosensis* (Fig. 3. YTN-1 3722.1-3722.3m-(4), 118:33; Fig. 4. YTN-1 3722.1-3722.3m-(4), 118: 32; Fig. 5. YTN-1 3722.1-3722.3m-(5), 120-18; Fig. 6. YTN-1 3722.1-3722.3m-(5), 120:17); Fig. 7. *Araucariacites australis*(YTN-1 3711.01m-(10),87:15A-37); Figs. 8,9. *Membranosphaera taiwaniana* (Fig. 8. YTN-1 3712.96m-(2), 91:31-26; Fig. 9. YTN-1 3712.96m-(2), 91:30-25) (Figs. 1,2;8,9 X1550; figs. 3-7 X600)

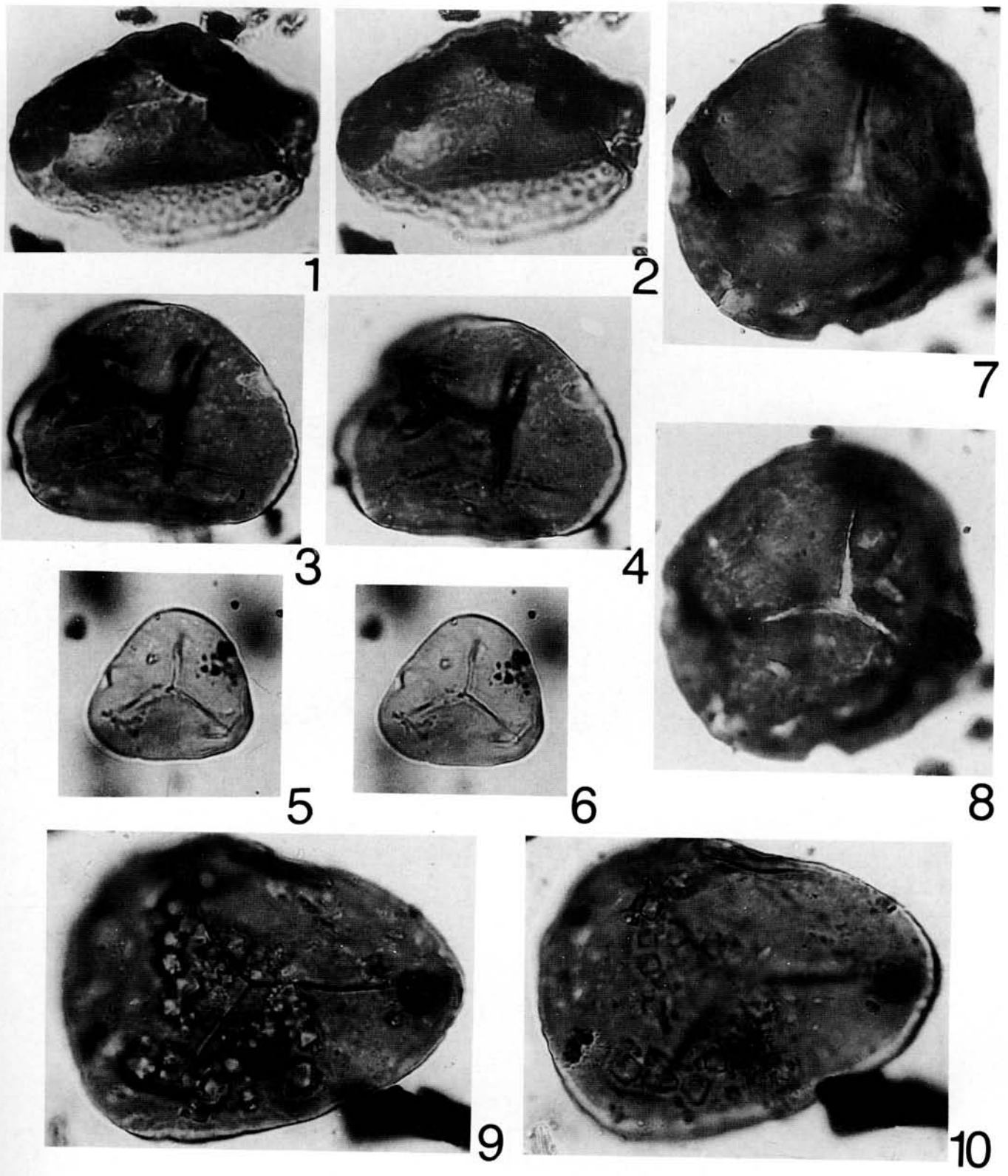


PLATE 45. Figs. 1,2. *Tricolpopollenites houpiensis* (Fig. 1. HP-1 4077.3-4077.9m-(2), C6:1; Fig. 2. C6:2); Figs. 3,4. *Leiotriletes sphaerotriangulus* (Fig. 3. PK-3 2062-2064.03m-(1), A6:19A-11; Fig. 4. A6:18A-10); Figs. 5,6. *Leiotriletes wollffi* subsp. *brevis* (Fig. 5. YTP-1 1862m-(4), A8:44A-18; Fig. 6. A8:1A-19); Figs. 7,8. *Leiotriletes taiwanensis* (YKL-1 2312-2315m-(1), A7:34A-6; Fig. 8. A7:35A-7); Figs. 9,10. *Leiotriletes obovatus* (Fig. 9. PK-3 2036.1-2037.8m-(3), A7:16A-32; Fig. 10. A7:15A-31) (Figs. 1-2 x1550; Figs. 3-10 x1100)

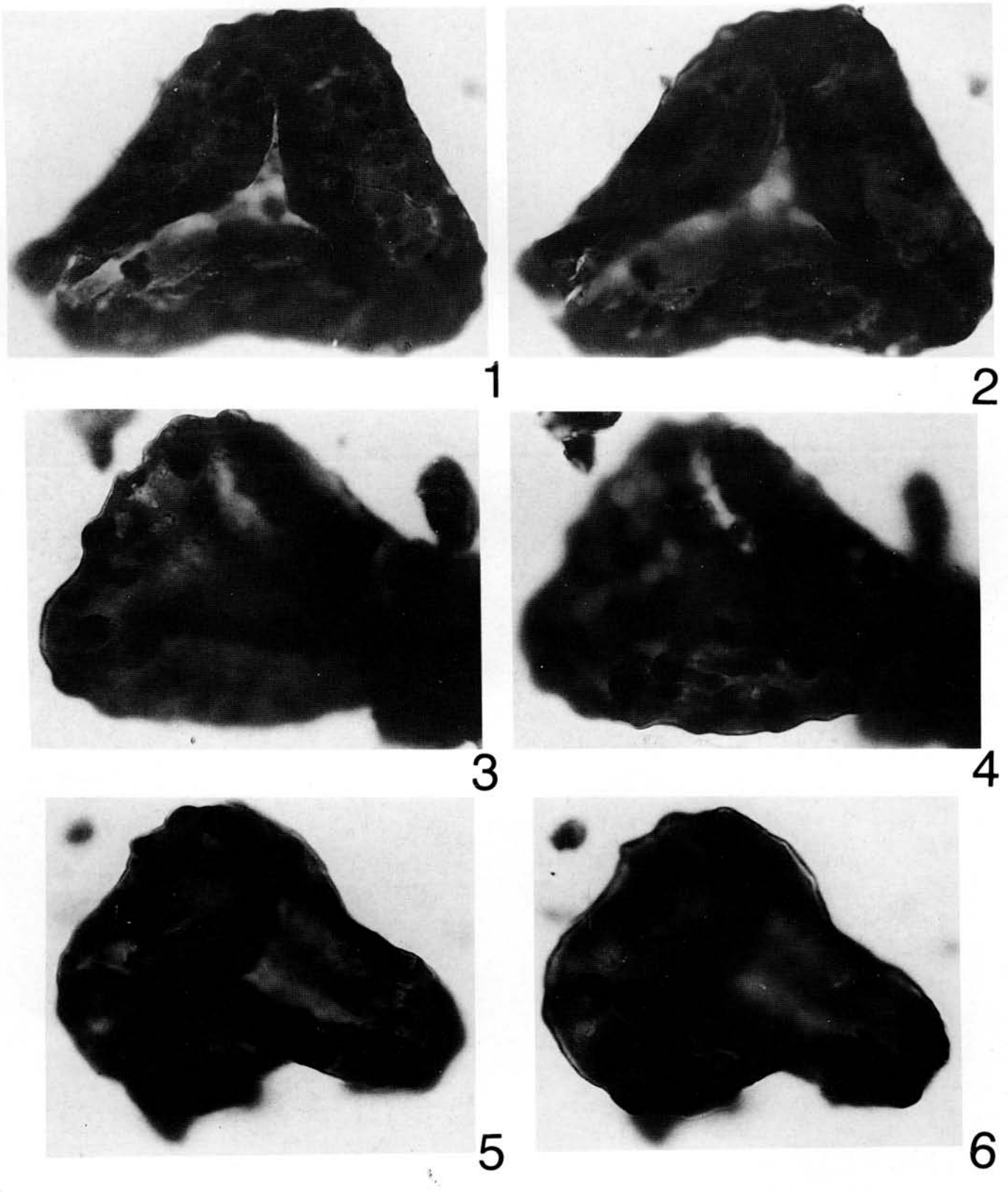


PLATE 46. Figs. 1-6. *Tuberositriletes formosensis* (Fig. 1. YKL-1 2312-2315m-(3), A7:3A-19; Fig. 2. A7:4A-20; Fig. 3. YKL-1 2312-2315m-(1), A7:30A-2; Fig. 4. A7:29A-1; Fig. 5. YKL-1 2312-2315m-(2), A7:40A-12; Fig. 6. A7:41A-13) (Figs. 1-6. x1100)

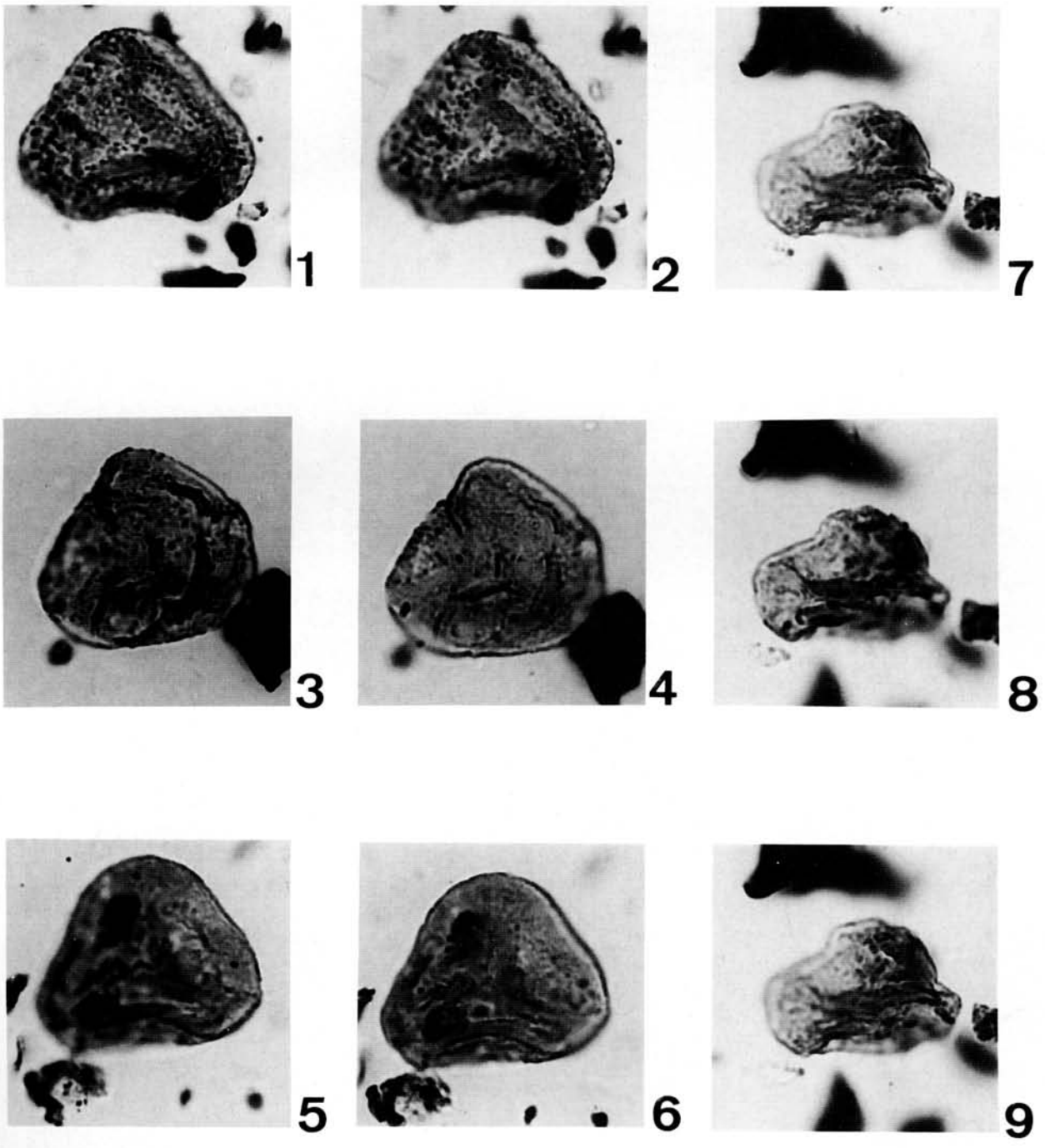


PLATE 47. Figs. 1-9. *Granulatisporites peikangensis* (Fig. 1. PK-3 2032.9-2034.4m-(1), A5:24A-12; Fig. 2. A5:25A-13; Fig. 3. PK-3 2073-2074.74m-(1), A5:41A-30; Fig. 4. A5:40A-29; Fig. 5. PK-3 2032.9-2034.4m-(1), A5:16A-4; Fig. 6. A5:17A-5; Fig. 7. PK-3 2032.9-2034.4m-(1), A5:13A-1; Fig. 8. A5:14A-2; Fig. 9. A5:15A-3) (Figs. 1-9. x1100)

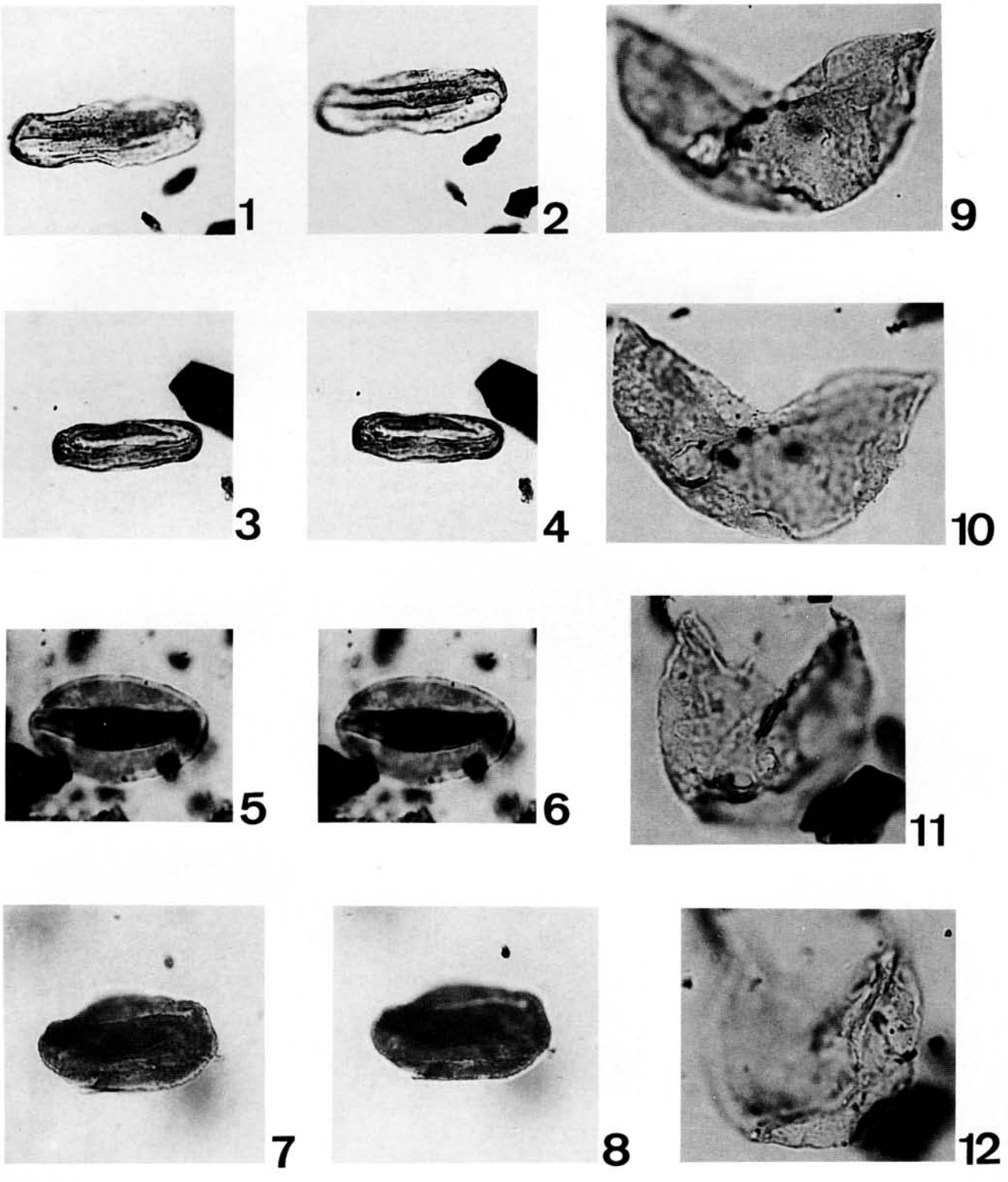


PLATE 48. Figs. 1-4. *Tricolpopollenites perprolatus* (Fig. 1. YPT-1 3794.07-3794.09m-(1), A1:27A-12; Fig. 2. A1:26A-11; Fig. 3. A1:22A-7; Fig. 4. A1:23A-8); Figs. 5,6. *Tricolpopollenites peikangensis* (Fig. 5. PK-3 2029.4-2031.24m-(1), A4:42A-25; Fig. 6. A4:43A-26); Figs. 7,8. *Tricolpopollenites orientalis* (Fig. 7. YKL-1 1305-1310m-(1),A6:28A-19; Fig. 8. A6:29A-20); Figs. 9-12. *Taxodiaceaepollenites taiwanensis* (Fig. 9. YKL-1 1305-1310m-(1), A6:24A-15; Fig. 10. A6:25A-16; Fig. 11. YTP-1 1717.5-(2),A8:39A-13; Fig. 12. A8:40A-14) (Figs. 1-12. x1100)

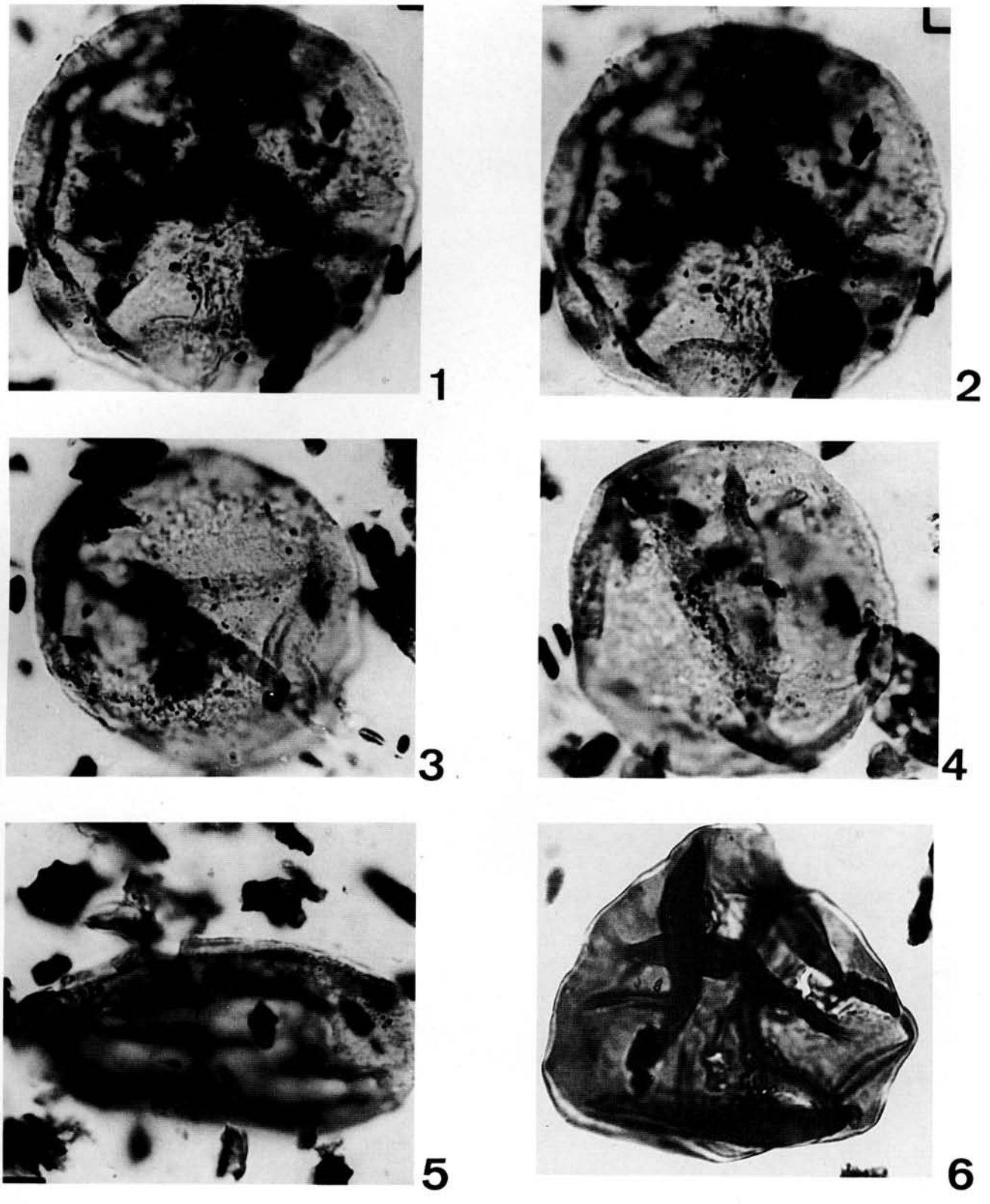


PLATE 49. Figs. 1-5. *Araucariacites australis* (Fig. 1. PK-3 2029.4-2031.24m-(1), A4:4A-30; Fig. 2. A4:2A-29; Fig. 3. PK-3 2029.4-2031.24m-(1), A4:9A-36; Fig. 4. A4:44A-27; Fig. 5. PK-3 2029.4-2031.24m-(1), A4:41A-24; A4:40A-23); (Fig. 6. *Laevigatasporites irregularis* (YNT-1 3702.54m-(1), 85:30-7) (Figs. 1-6. x1100)

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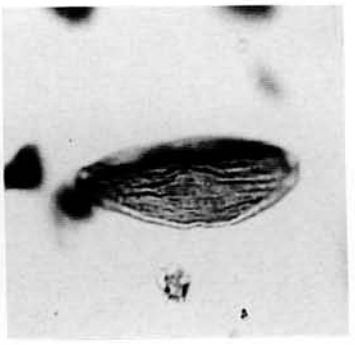
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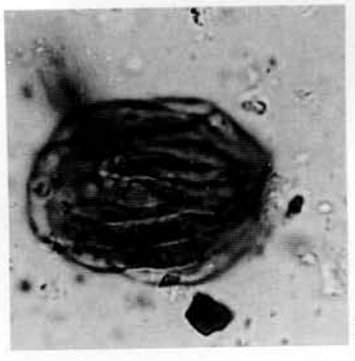
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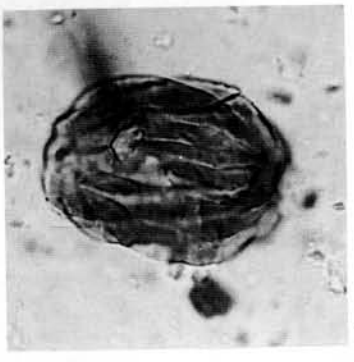
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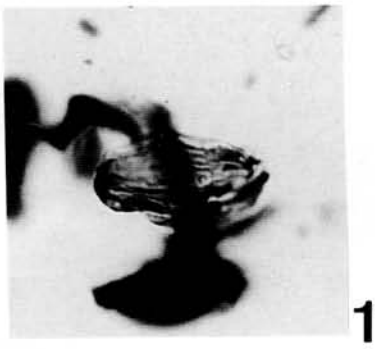
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PLATE 50. Figs. 1-4. *Ephedripites formosensis* (Fig. 1. YKL-1 2312-2315m-(1), A7:36A-8; Fig. 2. A7:37A-9; Fig. 3. PK-3 2029.4-2031.24m-(1), A7:14A-30; Fig. 4. A7:13A-29); Figs. 5-8. *Ephedripites speciosus* (Fig. 5. YKL-1 2155-2160m-(2),A7:9A-25; Fig. 6. A7:10A-26; Fig. 7. YPT-1 3679.5m-(1), A3:39A-1; Fig. 8. A3:40A-2); Figs. 9-12. *Ephedripites mundulus* (Fig. 9. YPT-1 3745m-(1), A3:7A-13; Fig. 10. A3:8A-14; Fig. 11. A3:2A-8; Fig. 12. A3:3A-9) (Figs. 1-12. x1100)

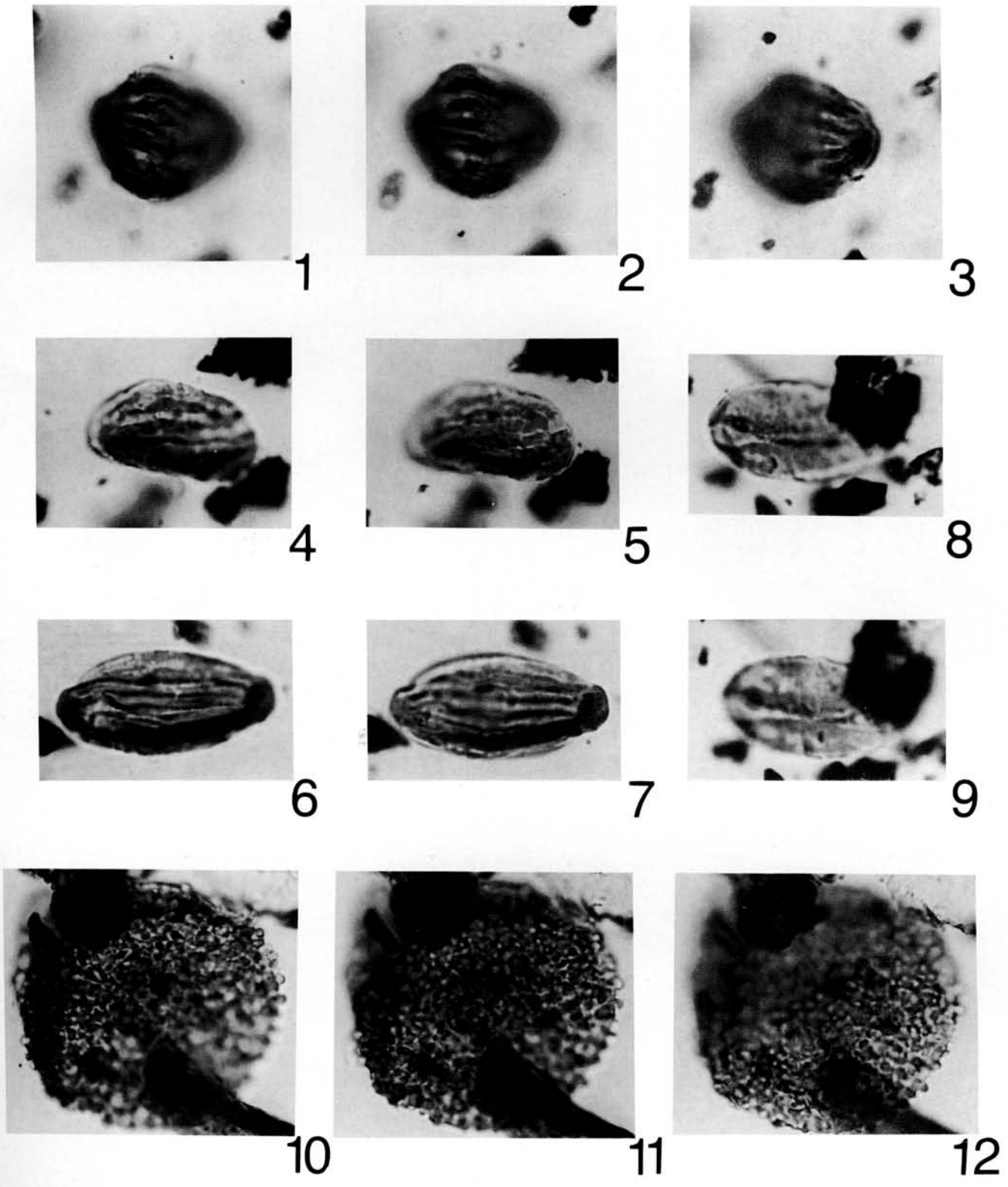
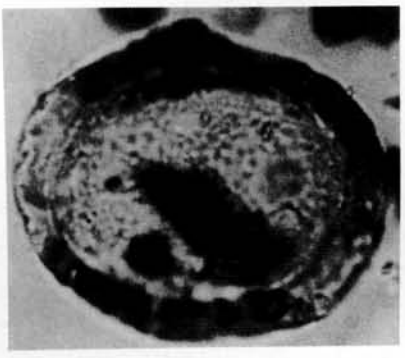


PLATE 51. Figs. 1-3. *Ephedripites chinensis* (Fig. 1. YKL-1 2312-2315m-(1), A7:31A-3; Fig. 2. A7:32A-4; Fig. 3. A7:33A-5); Figs. 4,5. *Ephedripites formosensis* (Fig. 4. YKL-1 1475-1480m-(1), A6:34A-25; Fig. 5. A6:35A-26); Figs. 6,7. *Ephedripites yunlinensis* (Fig. 6. PK-3 2047.0-2050.0m-(2), A5:28A-16; Fig. 7. A5:29A-17); Figs. 8,9. *Cycadopites yunlinensis* (Fig. 8. PK-3 2032.9-2034.4m-(1), A5:23A-11; Fig. 9. A5:22A-10); Figs. 10-12. *Zonalapollenites peikangensis* (Fig. 10. PK-3 2057.0-2058.05m-(2), A7:19A-35; Fig. 11. A7:20A-36;Fig. 12. A7:21A-37) (Figs. 1-12. x1100)



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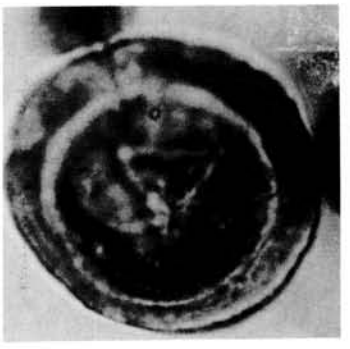

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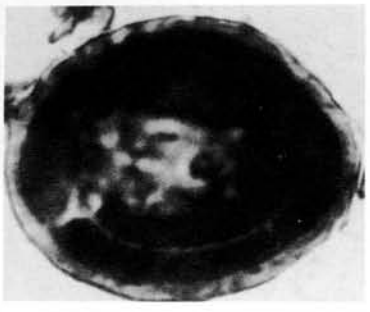

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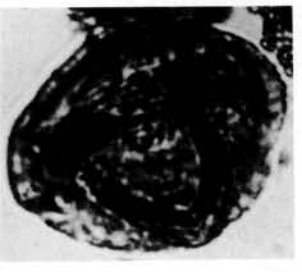

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PLATE 52. Figs. 1-5. Classopollis annulatus (Fig. 1. PK-2 1689m-(4), 106:31-26; Fig. 2. GH-1 1602m-(1), 106:41-36; Fig. 3. 106:42-37; Fig. 4. HM-3 3845-3848m-(1), 102:30-12; Fig. 5. PK-2 1620m-(2), 8:28); Figs. 6-9. Classopollis classoides (Fig. 6. PK-2 1620m-(2), 8:28; Fig. 7. GH-1 1602m-(1), 106:43-38; Fig. 8. 106:45-40; Fig. 9. 106:44-39.) (Figs. 1-9. x1550)

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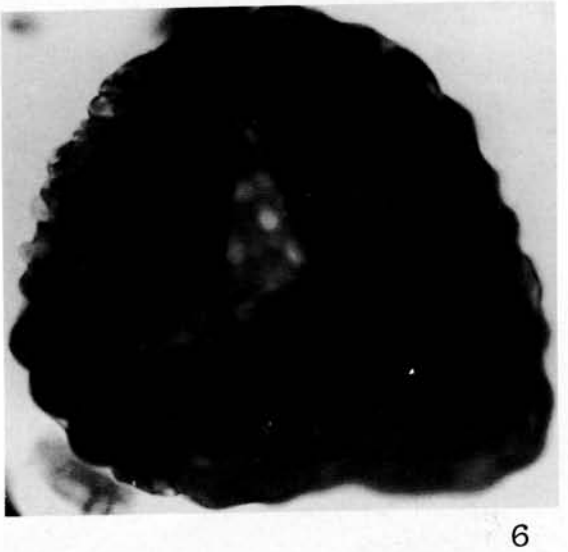

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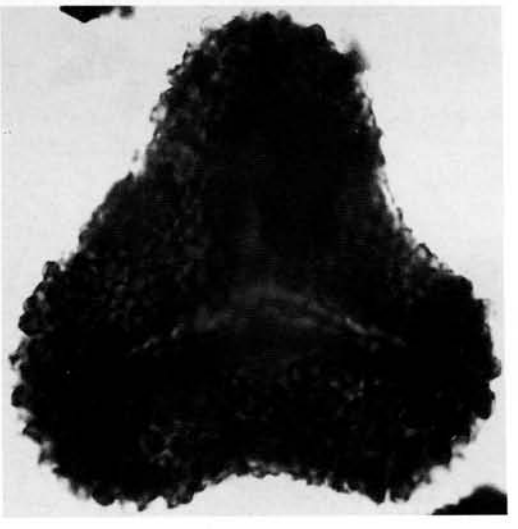

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PLATE 53. Figs. 1-4. *Classopollis parvus* (Fig. 1. GH-1 1602m-(1), 106:38-33; Fig. 2. 106:38-34; Fig. 3. PK-2 1689m-(4), 106:17-26; Fig. 4. 106:16-25); Figs. 5,6. *Corrugatisporites taiwanensis* (Fig. 5. YTP-1 1862m-(4),A8:3A-21; Fig. 6. A8:2A-20); Figs. 7,8. *Gleicheniidites peikangensis* (Fig. 7. PK-2 1689m-(4),106:32-27; Fig. 8. 106:33-28); Fig. 9. *Impardecispora taiwaniana* (YPT-1 3745m-(1),A3:9A-15.) (Figs. 1-4,7-8 x1550; Figs. 3-6,9 x1100)

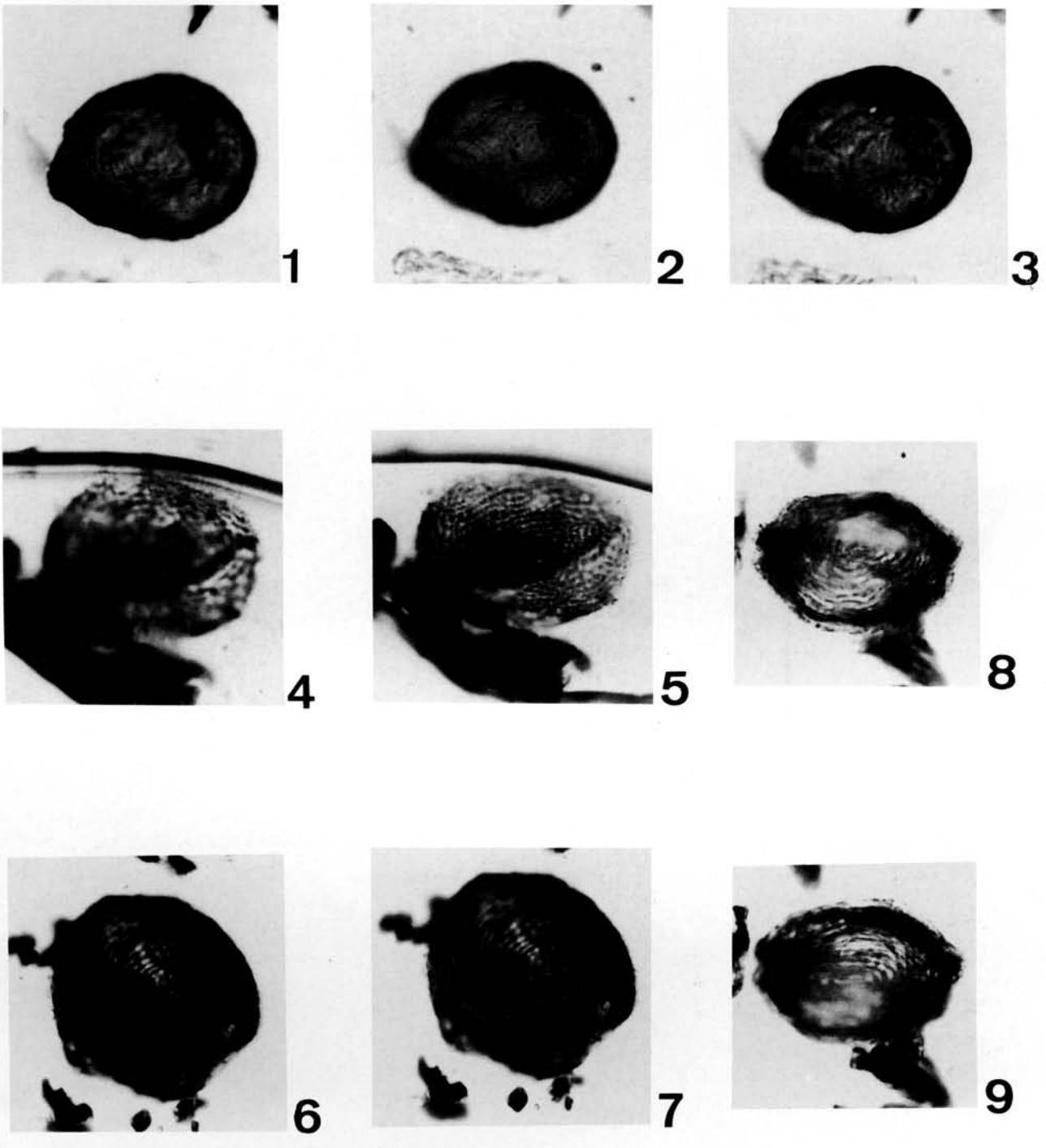

PLATE 54. Figs. 1-9. *Concentricystes cretaceous* (Fig. 1. YPT-1 3679.5m-(1), A3:41A-3; Fig. 2. A3:42A-4; Fig. 3. A3:43A-5; Fig. 4. YTN-1 3718.03 -3718.08m-(2), A3:19A-25; Fig. 5. A3:20A-26; Fig. 6. A3:21A-27; Fig. 7. A3:22A-28; Fig. 8. YPT-1 3679.5m-(4), A2:25A-24; Fig. 9. A2:26A-25) (Figs. 1-9. x 1100)